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ABSTRACT

This document reports the results of work in identifying promising approaches to the provision of technological update to vocational/technical teachers, and discusses barriers and facilitators to the use of these approaches. Technological update refers to the technical knowledge and skills needed by vocational/technical teachers to provide students with the up-to-date technological preparation needed in the current work world. After information was gathered from the field, literature, knowledgeable observers, and vocational education institutions and agencies, researchers applied cost-effectiveness, complexity and locus of administrative control criteria to select those approaches that offer promise for secondary and postsecondary vocational/technical teachers. These approaches are described in general terms, and descriptions are provided of specific programs that exemplify each approach. Two different kinds of approaches were identified and are reported in the document. First, six specific delivery techniques are described: work experience internships; university and college course work; workshops, conferences, and seminars; industry observation; education and industry staff exchange; and part-time employment. Second, three different types of update programs are described: local programs, nonlocal programs, and industry training and updating programs. The result is nine descriptions of promising approaches to the task of providing technological update, each with its own potential for providing update, administrative characteristics, advantages, disadvantages, and barriers and facilitators. The need for further research on locating and generating funds for updating programs is suggested. (KC)

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UPDATING TEACHERS FOR TOMORROW'S TECHNOLOGY: PROGRAMS & PRACTICES

Michael E. Wonacott
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The National Center for Research in Vocational Education
The Ohio State University
1960 Kenny Road
Columbus, Ohio 43210
1983

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FOREWORD

Technological update refers to the acquisition of technical (as opposed to pedagogical) knowledge and skills needed by vocational/technical teachers and instructors to provide their students with up-to-date preparation for the current technology of the world of work. More and more, vocational teachers must have the opportunity and the means to stay current with the fast-changing technology of their fields.

This product is designed for use by vocational educators and others faced with the problem of providing technological update to vocational/technical teachers: local school, institution, and district administrators; teacher educators; vocational/technical professional development leaders; state and federal department of education personnel; and others concerned with the design and implementation of programs to update the technological knowledge and skills of teachers. The product addresses the need for clear and reliable information on the variety of approaches available for use: which approaches have the most promise for use in the update process, how those approaches function, what the advantages and disadvantages of each are, and what barriers and facilitators affect the implementation of each.

The product draws heavily on information reported by qualified observers in papers describing their perceptions of the status of technological update and approaches to technological update in their states. Appreciation is extended to the following individuals who authored papers on the situation at the secondary level in their states: Vic Van Hook, Oklahoma Department of Education; James Kendrick, Alabama Department of Education; Charles W. Wade, Kentucky Department of Education; George Ferns, Michigan State University; Franklin King, University of Missouri-Columbia; Joyce R. Moyer, Pennsylvania Research Coordinating Unit; Gloria Williams, Connecticut Department of Education; Gary Lloyd, Utah Office of Education; and R.D. Bristow, Texas Education Agency.

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Robert E. Taylor
Executive Director
The National Center for
Research in Vocational Education

EXECUTIVE SUMMARY

This document reports the results of work in identifying promising approaches to the provision of technological update to vocational/technical teachers and barriers and facilitators to the use of those approaches. Technological update refers to the technical (as opposed to pedagogical) knowledge and skills needed by vocational/technical teachers and instructors to provide their students with up-to-date preparation for the current technology of the world of work. Information on approaches now in use to update teachers' technological knowledge and skills was gathered from the literature, knowledgeable observers, and vocational education institutions and agencies. Criteria related to cost-effectiveness, complexity, and locus of administrative control were then applied to select those approaches that appear to offer promise in providing technological update to secondary and postsecondary vocational/technical teachers. These approaches have been described in general terms, along with the advantages and disadvantages of each and relevant barriers and facilitators. Finally, descriptions are provided of specific programs that exemplify each approach.

Two different kinds of approaches were identified and are reported in the document. First, six specific delivery techniques are described: work experience internships; university and college course work; workshops, conferences, and seminars; industry observation; education and industry staff exchange; and part-time employment. Second, three different types of update programs are described: local programs; nonlocal programs; and industry training and updating programs. Major barriers or facilitators include availability of funding, motivation, and policy.

The result is nine descriptions of promising approaches to the task of providing technological update, each approach with its own potential for providing update, its own administrative characteristics, advantages and disadvantages, and barriers and facilitators. The information in these descriptions should be useful to vocational educators in many different settings who are faced with the problem of keeping teachers abreast of today's fast-changing technology: local school, institution, and district administrators; teacher educators; vocational/technical professional development leaders; state and federal department of education personnel; and others concerned with the design or implementation of programs to provide technological update for vocational/technical teachers.

Analysis of the findings reported in this document leads to some important conclusions. Availability of funding and motivation are cited as the two most common barriers to all approaches to technological update. From this it can be concluded that insufficient funds are currently being devoted to this most pressing issue. Further, the roles and responsibilities of the various agents involved in the whole process of technological update are insufficiently defined: What should be the role of teachers? Of administrators? Of teacher educators? Of state and federal departments of education? Of business and industry? What responsibilities should be assigned to each? How can each be motivated to fulfill appropriate roles and responsibilities? The answers to these questions should be sought in further research and development work.

INTRODUCTION

Vocational teachers and instructors today often need to update their own technical knowledge and skills to keep pace with the fast-changing technology of the world of work. Secondary and postsecondary vocational education institutions employ a wide variety of approaches in providing technological update to their teachers and instructors. Most vocational educators could cite many of these approaches. Such traditional devices as sabbatical leave allow teachers substantial time away from their classroom duties for professional or technical training; workshops on a vast array of topics abound in education today; contact with advisory committee members is familiar to most vocational educators; return to work in business or industry is an idea that can arise from common sense alone.

Not all of these approaches, however, have equal potential for achieving the goal of vocational teachers who wish to be up to date in the technology of their occupations. One approach may be less effective than another. Some may be costlier than others, or may be more attractive to teachers or administrators, or may require collaboration with local business and industry. Numerous barriers and facilitators such as these may either help or hinder the use of any given approach.

A clear and straightforward treatment of these many approaches to technological update of vocational/technical teachers, and barriers and facilitators to those approaches, is needed. Busy administrators at all levels from local schools, institutions, and districts to state departments of education need information to address this problem. What are *promising* approaches to technological update? How are these approaches administered? What are the advantages and disadvantages of each? What barriers and facilitators operate in the implementation of each approach?

This document seeks to answer those questions by presenting information from a variety of sources that would otherwise be difficult or impossible for individual vocational educators to obtain. The knowledge, perceptions, and experience of vocational educators, institutions, and agencies from across the United States have been presented in a single volume so that they can be shared with other vocational educators without relying on the inefficient process of personal contact.

A review of the literature, the perceptions of selected qualified observers, and reports of vocational education institutions and agencies led to the identification of nine promising approaches to technological update of vocational/technical teachers and instructors. Six of these approaches are specific delivery techniques: work experience internships; university and college course work; workshops, conferences, and seminars; industry observation; education and industry staff exchange; and part-time employment. The other three approaches are types of update programs: local programs; nonlocal programs; and industry training and updating programs. Analysis of the implementation of these approaches led to the identification of advantages and disadvantages of each approach and barriers and facilitators to the use of each. (For a more detailed explanation of the procedures employed in developing the document, see appendix A.)

The document contains generic descriptions of each of the nine approaches to technological update used by different educational agencies across the nation. The advantages and disadvantages of each approach are described, and barriers and facilitators to the approaches are identified. Finally, descriptions are given of selected programs operated by secondary schools and districts, postsecondary institutions, universities, and state departments of education that exemplify each approach, in whole or in part.

The information contained in this document should be useful to vocational educators faced with the problem of technological update of teachers: local school, institution, or district administrators; teacher educators; vocational/technical professional development leaders; state and federal department of education personnel; or any others concerned with the design or implementation of programs to provide technological update to vocational/technical teachers.

SPECIFIC DELIVERY TECHNIQUES

Work Experience Internships

One promising approach to the provision of technological update for vocational/technical teachers is the work experience internship. The approach is used by a variety of vocational education institutions under a variety of names—occupational experience, return to industry, industrial leave, occupational renewal, and others.

Administrative Characteristics

The work experience internship has several typical characteristics:

- Instructors return to perform actual work in business or industry in their own fields.
- Specific objectives that instructors are to achieve are often determined in advance of their actual return to the work place. In some schools and colleges, instructors must justify their choice of objectives to be achieved by specifying how those objectives will be incorporated in future instruction.
- Businesses or industries to which instructors return are typically required to provide work experiences that will allow the achievement of the instructors' specified objectives.
- Instructors' progress and performance in the work experience internship are likely to be reported and evaluated. Reporting and evaluation are most often informal and may be performed by the participating instructors, a supervisor or administrator of the school or college, or a supervisor in the business or industry. Supervisory visits by school or college personnel to the actual work place are infrequent, although they do occur.
- Internships commonly last from one to ten weeks. Some vocational education institutions do make provisions for longer work experience internships—up to one year, for example. Longer work experience internships, however, typically require that the instructor be granted extended sabbatical leave.
- Provision is usually made so that instructors suffer no financial loss through participation in work experience internships. Often, the school or college continues the instructors' regular salary during the internship; such a continuation usually carries a stipulation that the instructors receive no salary or wages from the business or industry providing the experience. Another possible arrangement is for instructors to receive pay from business or industry but consign the pay to the school or college while remaining on regular instructional salary. Internships carried out on the instructors' own time (e.g., during holiday or summer vacations) do not affect their regular teaching salary.
- More often that not, instructors are given released time from teaching duties to participate in work experience internships. If so, the school or college provides

substitute instructors for the period of the internship. Although this released time can be provided under a traditional sabbatical leave policy, it is more commonly governed by other policy statements. Some institutions, on the other hand, make no provisions for released time from teaching duties, requiring instructors to participate in the internships on their own time. In exchange for released time, some institutions require a commitment from the instructors to return to teaching duties for a specified period of time after the internship (e.g., one year).

- A program of work experience internships is usually implemented at the local level by the individual school, college, or district. Less common are internship programs operated by state departments of education or teacher education institutions. Local programs tend to be administered less formally than those having wider geographic impact.

Although work experience internships share some characteristics with other approaches to providing technological update, certain constants differentiate them from such other approaches. They differ from business and industry observations in the nature of the experience provided to the instructor. The work experience internship necessarily involves actual hands-on work with the technology of the work place, leading to the development of discrete skills in the technology. Observations, on the other hand, provide only for the development of knowledge of the technology (and are usually of shorter duration).

Likewise, work experience internships differ from summer employment of teachers in business and industry. While an internship is typically carried out during released time from instructional duties, summer employment tends to be ungoverned—teachers seek it on their own initiative and in their own way, participate in it according to their own ideas and for their own purposes, and are accountable only to themselves for their progress and performance in acquiring new technological knowledge and skills.

Advantages and Disadvantages

There are both advantages and disadvantages to the use of work experience internships in providing technological update for vocational/technical teachers. Among these are the quality and nature of instruction provided to teachers in the technology. The nature of instruction is potentially the greatest advantage, while the quality of instruction can, in individual cases, be a disadvantage.

Nature of Instruction. The nature of instruction available to teachers in work experience internships is at least potentially of high quality. In an internship, the teacher has the opportunity to learn from the best possible source—those who work with and use the technology closely and daily. Workers and supervisors who are in constant and immediate contact with the technology are most likely to have the knowledge and skills that the teacher is seeking to acquire.

Furthermore, the instruction available in an internship can be intensive, sustained, and comprehensive for the teacher. Released from the daily concerns of teaching duties and assigned to a regular work station in business or industry, the teacher has the opportunity to focus his or her entire attention on the task at hand. During a long internship, the teacher can acquire knowledge and skills in numerous areas of the technology—different pieces of equipment, different functions of the technology, different areas of technology, and so on. Finally, instruction can cover not only knowledge of the technology but also hands-on skill in it as well.

Quality of Instruction. The quality of instruction provided in work experience internships, however, can be more problematic. Often, supervisors and workers in business and industry offer high-quality instruction to teachers in internships. Many schools and colleges report high levels of satisfaction by teachers and administrators with the instruction provided in internships. Doubtless, many business and industry supervisors have had enough experience in training new workers to be quite effective in helping teachers acquire the knowledge and skills they need.

The fact remains, nonetheless, that most work experience internships are rather loosely supervised and reviewed. No matter how well intentioned the participants, it is possible that efficient and effective instruction will not be offered in a given internship. Business and industry personnel are, after all, not educators for the most part; there is always the chance that a teacher will not be taught in a way that allows him or her to learn effectively.

Need for substitute teachers. Another obvious disadvantage of work experience internships carried out during released time is the need to use substitute teachers. This comment is not meant as a reflection on the expertise of substitute teachers. However, students confronted with a change of teachers in the middle of a term must adjust themselves to the new individual and the individual's style of teaching and interacting. Such an adjustment is hardly likely to halt progress in the classroom and laboratory but does constitute a disruption in the routine of instruction, temporarily slowing progress. In high-technology areas, furthermore, adequate substitutes are often not available.

Barriers and Facilitators

Policy. Policy can be either a barrier or a facilitator in using work experience internships to provide technological update for vocational/technical teachers. Whether a given institutional, district, or state policy toward work experience internships is a barrier or facilitator depends on the details of the policy. Some policy statements would motivate teachers to stay up to date through work experience internships, while others would discourage the use of this approach.

The professional development policies of individual schools, colleges, or districts can serve as an example of this dichotomy. Many such policies quantify professional development activities by using, for example, such arbitrary units of measurement as professional development credits (PDCs). Different kinds of development activities can then be assigned relative values by converting them into PDCs according to a prescribed schedule. For instance, one semester hour of college course work might be worth one PDC, eight clock hours of workshop or seminar attendance worth one-half of a PDC, and so on. The relative weight of participation in work experience internships, expressed in PDCs, determines whether internships are a good or bad bargain compared to other professional development activities. If one semester hour of college credit is worth one PDC and 100 hours of participation in work experience internships is also worth one PDC, many teachers will justifiably feel that they can get their PDC with less time and effort through college credits. If, on the other hand, relative value in PDCs more closely reflects the actual time and effort required of teachers using different approaches, teachers are more likely to choose their approach on its own merits and their own needs.

The same argument applies to state recertification policies as well. If recertification requirements are expressed in arbitrary units like PDCs, the relative value assigned to different approaches will influence teachers' choices of which approaches to follow as long as any choice is allowed. Policy statements on salary increases can have an identical effect on teachers' choices by favoring one type of activity over another.

Money. Money—although a critical factor in many approaches to technological update—is highly important in work experience internships in most cases. Since the typical internship arrangement calls for teachers to remain on their regular teaching salaries while absent from teaching duties, internships usually involve the added expense of substitute teachers. In these days of tight operating budgets throughout education, many schools and colleges may be forced to decide that they cannot afford such an expensive approach to technological update. At best, the cost of internships may force institutions to restrict the number of teachers participating in internships, which limits the effectiveness of the approach to the institution as a whole.

Relationship between vocational education and business/industry. The nature of the relationship between vocational education and local business and industry can be either a barrier or a facilitator in carrying out work experience internships. It cannot be denied that placing an instructor into a job position for ten weeks can be an inconvenience to a business or industry. Ten weeks (usually the maximum time allowed by schools or colleges for internships) is likely to be too short a period of time for the business or industry to benefit fully from the instructor's training. Ten weeks may be barely sufficient for the instructor to become knowledgeable and skillful enough in the technology to function as a productive worker. Then, the ten-week period is over, the instructor leaves, and the business or industry must start all over again, hiring and training another new employee. On the other hand, the instructor may not fill a vacant position; instead, the business or industry may simply create an extra—and unneeded—position for the instructor. In either case, it is likely to cost the participating business or industry time and money to accommodate vocational education by placing the instructor.

This possible direct cost to the participating business or industry may, however, be offset in the long run by the indirect benefit to the business or industry of placing the instructor in an internship. The indirect benefit of the placement is the increased likelihood of graduates from the instructor's program having knowledge, attitudes, and skills more closely suited to the current needs of the work place. When the instructor returns to teaching and incorporates new occupational experiences into the curriculum, students can be brought into closer touch with the current technology of their fields. Thus, although business and industry may have to bear some inconvenience and short-term cost in providing internships, they may then be able to reap long-term benefits in recompense.

Key personnel in business and industry, of course, must be aware of this long-term balance of cost and benefit in work experience internships. If there is a close, sustained, collaborative relationship between vocational education and local business and industry, key personnel may have enough experience with vocational education to appreciate this balance immediately. Failing that, they will at least be receptive to the explanation of this balance by vocational teachers and administrators. Without a good relationship with vocational education, business and industry personnel are less likely to be receptive to the idea of long-term benefits, however real those might be.

Specific Program Descriptions

The **Lake County Area Vocational Technical Center** in Eustis, Florida, uses an approach called the Renewal of Occupational Experience. The approach was developed a few years ago to give instructors the opportunity to return to work in business or industry for the purpose of renewing their occupational skills. The instructor works up to five days at the host business or industry. The staff rotates through the experience, with each instructor having the opportunity to participate about once every three years.

Instructors continue to receive their regular teaching salary during the renewal experience and receive no pay from the host business or industry. The Center uses inservice funds to provide substitute teachers to assume the renewing instructors' teaching duties while they participate in the experience. In addition, participating instructors are reimbursed for mileage, meals, and lodging (the last if the renewal site is located outside the county).

Individual instructors begin the application process by identifying specific work skills and objectives to be met during the renewal experience. Then the instructor makes contact with the local business or industry at which he or she would like to work; this first contact is made either in person or over the telephone. Next the instructor sends a form letter, filled out appropriately, to the prospective host firm, enclosing a copy of a work agreement in which work skills and competencies are specified. The instructor agrees to work full shifts for the specified number of days, provide his/her own transportation and meals, comply with all rules and regulations of the firm, and respect the confidentiality of any work involved. Finally, the instructor informs the firm of his/her insurance coverage and licensure status as appropriate.

After initial contact between the instructor and the host firm but before the renewal experience actually begins, a site evaluation is performed by a school administrator. This site evaluation is done in person using a standard evaluation form. The evaluation is done on site unless the prospective host firm is location outside the county. The evaluation addresses the appropriateness of the firm, its equipment, its personnel, and its work duties to the instructor's specified renewal objectives. During this evaluation, an attempt is made to obtain the prospective work supervisor's agreement to work with the renewing instructor and complete pertinent evaluation forms concerning the renewal experience.

On the job, the instructor completes daily a work outline form on which the work tasks for the day are named and a brief description of the day's work is given. At the end of the experience, the instructor must complete a site and occupational experience evaluation using another standard form. This evaluation covers the appropriateness of the instruction and training provided to the instructor's objectives, the quality of supervision provided, the instructor's own performance during the renewal experience, and various aspects of the instructor's and the host firm's interest in further participation in the Renewal of Occupational Experience approach. Items also cover lines of communication and contacts established between the instructor and the host firm.

The host firm has its opportunity to evaluate the renewing instructor as well. Another standard form is provided for this purpose, marked "Confidential" and to be seen only by the administrator who receives the evaluation. This evaluation covers such areas as the appropriateness of training to the instructor's stated objectives, the instructor's performance during the work experience, additional instructor update needs, and the firm's interest and willingness to work in a collaborative relationship with the Center and its vocational programs. Suggestions are also solicited from the firm on possible improvements to the renewal experience and to the instructor's vocational program.

Greenville Technical College in Greenville, South Carolina, operates a Return-to-Industry program that began in 1978 when Greenville Tech formed a consortium with two other South Carolina technical colleges to apply for a faculty and staff development grant from the Appalachian Regional Council. The grant was awarded and each of the three colleges set up its own in-house program to administer its portion of the grant funds for the three years of its duration.

The grant program at Greenville Tech is administered by the regular Faculty and Staff Development Coordinator and consists of mini-grants to faculty members, who write their own proposals for mini-grant activities. The Faculty and Staff Development Coordinator acts as liaison between the faculty and the Mini-Grant Committee, which consists of the college's nine division deans, the dean of instruction, and the vice-president for education. The Mini-Grant Committee meets once a quarter to review proposals for mini-grants.

The proposals submitted by faculty members outline activities that are to last one quarter. If funded, the mini-grant pays the cost of a substitute teacher so that the grant recipient can be provided released time from part of his/her regular teaching load. Recipients receive their regular teaching salary during the quarter, teach a reduced load, and perform the mini-grant activities. They receive *no* salary from the host business or industry.

During the first year of the three-year grant, all faculty proposals submitted were for course development or refinement; sixty of these proposed projects were funded. During the second year, funding was provided for forty-one curriculum projects and nine Return-to-Industry projects. For the third year of the grant, the college administration decided to limit funding of curriculum projects to one third of the total available funding. The remaining two-thirds was reserved for Return-to-Industry projects, of which thirty-three were funded.

Steps in applying for and participating in a Return-to-Industry mini-grant project are outlined in a set timetable. The application process, of course, is carried out before the quarter begins. The instructor must first submit a proposal, giving a brief summary of the project and stating at least two specific objectives to be met through the project. Once proposal awards are announced by the Mini-Grant Committee, recipients must submit the name of the specific industry site at which they will work. At the same time, they must name the industry supervisor under whom they will work and include a letter from that supervisor indicating his/her willingness to host the recipient during the quarter.

Once the quarter begins, the recipient commences actual work at the industry site and is responsible for keeping a daily log of activities at the work site. The recipient must submit a mid-term project evaluation to the Faculty and Staff Development Coordinator at mid-quarter; this evaluation may include the daily log of activities recorded to that point. Recipients are also required to list the products or outcomes of the mini-grant activities to be evaluated (e.g., study guides, new course outlines, improved student performance), methods of evaluation, and criteria to be used in the evaluation.

At the end of the quarter, the complete daily activity log is turned in along with the products or outcomes to be evaluated. The dean of the division in which the recipient teaches performs the final evaluation of the Return-to-Industry project as outlined in the recipient's mid-term project evaluation. A final evaluation may be performed by the recipient's industry supervisor as well.

Faculty members' comments on their own participation in Return-to-Industry projects are positive and enthusiastic. Grant recipients report high satisfaction with the quality of work experience they received—in relation to both knowledge and skills—during their return to the world of work. Further, they report that they plan to make or have been able to make changes in their course content as a result of their updated experience in the work place. They recommend the Return-to-Industry concept to other vocational/technical instructors. Finally, the administration of Greenville Technical College has made the decision that, upon expiration of the original grant funds, further institutional funding will be reserved almost exclusively for Return-to-Industry projects.

University And College Course Work

Perhaps the most commonly cited approach to providing technological update to vocational/technical teachers is traditional university or college course work. Many vocational teachers, instructors, and administrators originally acquired their own professional pedagogical training using this approach, so it has been only natural to extend the use of the approach to the provision of technological update.

Administrative Characteristics

A program of university and college course work for technological update characteristically functions in the following manner:

- Instructors enroll for selected undergraduate or graduate courses at a college or university that are an established part of the curriculum.
- The process of selecting courses to be taken varies widely from one situation to the next. At one extreme, individual instructors select courses entirely on their own initiative and at their own convenience and expense to suit their own taste. At the other, instructors must justify the course selection to their school or college administrator by demonstrating its relevance to the program curriculum and its potential for improving instruction to prepare students for the world of work. Between these two extremes lie numerous variations in the extent to which this approach is regulated and monitored by educational authorities.
- Although instructors generally enroll for courses during nonteaching hours (i.e., evening hours or summer vacation), some vocational education institutions do provide released time from teaching duties for teachers to pursue course work. In its most extreme form, this released time is provided as sabbatical leave, usually reserved for long-term degree-oriented course work.
- Instructors' progress and performance in university or college course work are usually not closely supervised or monitored. When schools or colleges reimburse instructors for tuition expenses, they generally require only proof of payment and successful course completion, success being typically defined in terms of letter grades. When university and college courses are nonreimbursed professional development activities, proof of successful course completion is usually the only requirement.
- The focus of course work is likely to be less well defined than that of other approaches to technological update. As is often the case with courses at any level, instructors and administrators tend to think in terms of topical areas and very general learning objectives. An institution that requires instructors to justify other update activities by stating precise objectives for the activities is often likely to be satisfied simply with a course title as justification for this activity.

One basic feature differentiates this approach from a bona fide university *update* program. As explained previously, instructors generally assess their own needs for course work informally and on their own initiative. A university update program, however, usually has a more formal needs assessment component, ensuring that the update activity is appropriate to the teacher's needs and will result in improved instruction. A university up-date program is very often an ad hoc effort to address specific perceived problems in an entire geographical area or vocational program area. In the course work approach, on the other hand, instructors often simply open the regular course catalog and browse until they find something that seems interesting and pertinent to them personally.

Advantages and Disadvantages

There are two potential disadvantages to university and college course work as an approach to technological update of vocational/technical teachers. One of these is the level of expertise available among university and college faculty. The second is the appropriateness of this activity to teachers' specific update needs. One advantage is the information resources of faculty.

Level of expertise. While it is no doubt true that many individual university and college faculty members are in touch with the latest technological developments of their fields, some question remains as to whether universities and colleges are the best source of current expertise for vocational teachers. Some university and college faculty members may be in the same situation as their secondary and postsecondary colleagues. These faculty members have sometimes been away from the work place for as long as secondary and postsecondary teachers. They may have had little or no more opportunity to experience firsthand the effects of new technology on day-to-day work than secondary and postsecondary teachers seeking update.

Appropriateness. The appropriateness of university and college course work to teachers' update needs is also sometimes questionable. University and college campuses often have the same financial limitations as secondary and postsecondary vocational education institutions; as a result, the physical plant (e.g., tools, machinery, equipment) may be no more up to date than that of the vocational teacher's home institution. While this would not prevent vocational teachers from acquiring knowledge of new technology, it would prevent their acquiring hands-on experience in the operation of that technology. Appropriateness, then, would depend on the individual vocational teacher's own need for update. Those seeking knowledge of new technology might do well to enroll in university and college courses, while others in need of hands-on experience might be inadequately served by the approach.

Another problem can arise in relation to the appropriateness of university and college course work. As stated previously, teachers' selection of courses and their progress and performance in them are often not closely monitored. Because of this, teachers often act on their own initiative without closely defining their specific update needs. The paperwork for fee reimbursement for example, may only require teachers to list a course title as a check of appropriateness of content. This invites teachers to think in broad, general, topical terms and not in terms of specific, task-oriented objectives that will increase their ability to prepare their students for the actual tasks to be performed in the world of work. Because of the administrative characteristics of this approach, there is simply less likelihood that the particular activity chosen will result in vocational teachers' acquiring the exact technological knowledge and skills they need to bring their instruction up to date.

Information resources. The advantage of this approach to technological update, on the other hand, is the great potential of university and college faculty to act as information brokers. While their own personal expertise may not be sufficient to meet individual teachers' update needs, the very nature of the faculty members' role in the educational community often equips them admirably as linking agents between those who need current expertise and sources of that expertise. They should be able, with the entire resources of the university or college at their disposal, to tell vocational teachers how to go about updating their knowledge and skills. Faculty members can very often put teachers in touch with the standard information resources of the educational community and the technology of their own area. Further, they are frequently able to identify personal contacts in the local business, industry, or education community who can share the latest technological knowledge and skills with vocational teachers. This role of resource broker is perhaps the most important one to be played by university and college faculty in technological update efforts.

Barriers and Facilitators

Policy. The policy of vocational education institutions is more likely than not to facilitate the use of university and college course work to gain technological update. By and large, school and college professional development policies make specific reference to graduate or undergraduate course work as a means of fulfilling professional development obligations. Likewise university or college course work is often assigned a high relative weight in systems that use such units of measurement as PDCs. The same situation often applies to state recertification policies.

Money. The availability of funding can be either a barrier or facilitator in the use of this approach. The more funds the institution has and is willing to pass on to teachers to pay for course work, the more likely it is that teachers will use the approach. In fact, the relatively low cost of course work per teacher (compared, for example, to work experience internships) can make this approach appeal to administrators who want to involve as many teachers as possible in update efforts in a given period of time. Furthermore, since there is often no established pattern of reimbursement to teachers for the expense of course work, the issue of funding may be irrelevant. As with any approach, however, some teachers will resist the notion of enrolling for course work at their own expense. In individual cases, then, a lack of funds can be a barrier to the use of this approach.

Time. Time, in which teachers can attend courses, acts again as either a barrier or a facilitator. It appears less common, however, for teachers to expect their administration to provide released time from teaching duties for attending courses. In general, teachers are willing to assume the responsibility for using their own personal time (e.g., evenings, vacations) to pursue course work. In this respect, the established practice of many universities and colleges of offering evening, weekend, and summer course work for inservice teachers further facilitates this approach.

Nature of the activity. The very nature of the activity itself often acts as a barrier or a facilitator in this approach, depending on the personality and preferences of individual teachers. Some teachers enjoy and are comfortable with the idea of taking academic courses with all that they include—lectures, textbook readings, paper-and-pencil examinations, and so on. Other teachers, however, prefer the atmosphere and environment of the work place or of other, short-term, less formal instructional settings (e.g., workshops or seminars). In addition, some vocational/technical instructors feel, rightly or wrongly, that university and college faculty members exist in an ivory tower, far from the daily reality of the world of work, unfamiliar with the practice of the theory that they teach.

Specific Program Descriptions

Dakota County Area Vocational Technical Institute in Rosemount, Minnesota, is a multilevel vocational education institution serving secondary, postsecondary, adult, and special needs populations, with a primary emphasis on the postsecondary component. Among the options offered to instructors for professional development is university or college course work taken for the purpose of improving their performance in their assigned roles. Specific guidelines have been established for reimbursement of tuition expenses associated with such course enrollments.

Reimbursement of tuition costs is available to full-time licensed staff members if the proposed course work meets one of three conditions. The course must be designed to (1) meet state licensure requirements, (2) improve teaching ability, or (3) provide technical content knowledge in the teaching area of the instructor. (In additon to these three conditions stated in the reimbursement policy, a further condition is stated on a form to be submitted for prior approval. This "Intention to Take a Course" form lists the purpose of improving nonteaching knowledge and skills required for duties at Dakota County AVTI. The form also contains a blank labelled "Other" in which instructors presumably can list other conditions that in their opinion should qualify the course for reimbursement.)

The first condition of payment stated in the reimbursement policy is that the applicant receive prior approval of the course work to be undertaken. This is done by submitting the "Intention to Take a Course" form referred to previously and should be carried out prior to enrollment in the course.

Dakota County AVTI works with the University of Minnesota in offering a program of courses on the Dakota County campus; the Special Services Division of the State Department of Vocational-Technical Education helps to coordinate the arrangements. This is a regular program consisting of one or two courses offered every quarter. Instructors enrolling in these on-campus courses need not submit descriptive materials in their reimbursement applications. When instructors wish to take off-campus courses, however, they must include descriptive backup materials on the course they wish to take. Catalog or bulletin course descriptions are regularly accepted as filling this requirement.

Only tuition costs are reimbursable; such other costs as travel, books, and supplies are explicitly excluded. (The one exception to this principle is travel costs to attend industry or service schools located elsewhere. If it is necessary that instructors travel to these schools, provision is made for travel reimbursement from program funds, through separate accounts and under separate authorization.)

The staff member must first pay his or her own tuition and then submit evidence of payment, along with evidence of successful course completion, to receive reimbursement. A passing grade shown on an official transcript or grade report is accepted as evidence of successful course completion. Another option is to have the university or college faculty member fill out a special course completion form used in the state for just such reporting purposes.

Finally, courses are to be taken on the instructor's own time and must not conflict with the fulfillment of normal instructional duties. Grade records for courses completed must be submitted by instructors for inclusion in their licensure files before further request for course reimbursement will be considered.

The Mequon-Thiensville School District of the city of Mequon and the village of Thiensville, Wisconsin, has a staff development policy that requires all teachers to earn four staff development credits every two years, with at least one credit to be earned yearly. The main focus of the district's staff development program is its in-house course component. These in-house courses are organized in ten-hour blocks, each ten hours of instruction being worth one credit. Instruction is offered either by external consultants with appropriate knowledge and expertise or by district staff.

Another means by which teachers can earn staff development credits is university and college course work. Teachers receive one credit for each semester credit of course work taken. The district's staff development policy explicitly allows credit for any official university or college course carrying university or college credit and approved in advance by the superintendent of the district.

A negotiated agreement between the district's board of education and a professional organization representing the teaching staff makes specific allowance for teacher advancement on the salary schedule for accumulation of additional graduate or undergraduate credits or degrees. All approved credits count toward such advancement; approval of credits must be obtained prior to actual enrollment in the course work. Only one other option, other than increased seniority, is provided to teachers for advancement on the salary schedule—accumulation of additional work experience, with this option specifically limited to vocational/technical teachers.

The district does *not* offer reimbursement to teachers for tuition or other costs associated with taking university or college course work. This policy is due, in part, to limited availability of funds; it also arises from the primary emphasis placed on the district's in-house course component. To some extent, this policy may cause teachers to tend away from using such course work as a means toward professional development and technological updating.

Provision is made in district policy, however, for sabbatical leave for teachers. Sabbatical leave is allowed for graduate education (1) in the teacher's subject field or in a related field, (2) relating to educational research, or (3) to acquire a higher degree. Faculty members are eligible for sabbatical leave after teaching four years in the district, with the stipulation that no more than 3 percent of the total faculty be granted such leave at any one time.

A faculty member receiving sabbatical leave is granted one year's experience credit on the salary schedule; teachers are thus not penalized for their absence from teaching duties in relation to salary increases. Teachers granted sabbatical leave must agree in writing to return to the district for at least one academic year upon completion of the leave. Application procedures require that applicants state the nature and content of the study to be pursued, explaining how this activity will benefit them and the students of the district.

Teachers on sabbatical leave receive no pay. Few teachers request or receive such leave. In the past four years, only two teachers have applied for sabbatical leave. One teacher received and took the leave; the other resigned his teaching position shortly after applying for the leave.

Workshops, Conferences, and Seminars

Workshops, conferences, and seminars have become widely popular and used for staff development and training purposes in many business, industry, and education settings. Vocational educators and administrators very often share this general enthusiasm, which results in the frequent use of workshops, conferences, and seminars as a means of providing technological update to vocational/technical teachers.

In most instances there is no perceptible difference between a workshop and a conference and a seminar—nomenclature appears to be highly individual and a matter of taste. Hence for convenience' sake, the term *workshop* will be used for the remainder of this discussion.

Administrative Characteristics

There can be great variation in the way individual schools, colleges, and districts implement programs of workshops, seminars, and conferences as a means of providing technological update. However, the following general characteristics are typically discernible:

- Instructors attend relatively short training sessions targeted specifically to content and to audience (e.g., a workshop on electronic ignitions for automotive instructors). The length of these training sessions varies from one day to one week. Longer workshops do occur but are relatively uncommon.

- Subject matter experts are typically used as instructors in workshops. Very often, current workers or supervisors in business or industry are brought in as consultants to give workshops. Given the source of expertise tapped in this approach, the instruction provided is usually perceived as quite up to date and pertinent to the participants' needs.

- Although many workshop activities are informational in nature, giving teachers up-to-date knowledge of technology, there is often considerable emphasis on hands-on activities and development of specific technological skills. In many instances, actual items associated with the technology (tools, machinery, equipment, and so on) are made available for skill development. Thus, in spite of the limitations imposed by the short duration of workshops, instruction can be thorough and intensive in the targeted content.

- In some cases, a formal program of workshops is organized and offered by an education agency—school, college, district, teacher education institution, state department of education, or professional organization. In these cases, the sponsoring agency generally conducts a needs assessment to determine the content to be covered. The extent of the needs assessment is dictated by the interests of the sponsoring agency: a state department needs assessment usually includes all secondary or postsecondary instructors in the state; a secondary school would restrict its assessment to its own teachers; and a professional organization would poll its entire membership, whether that be local, state, or national.

- In other cases, no formal program of workshops exists. Rather, teachers are simply urged to identify and attend workshops appropriate to their own needs and on their own initiative. This encouragement of workshop attendance may be formally and forcefully stated in, for example, a professional development policy. It may also be given informally in casual personal interaction between administrators and teachers. Whether encouragement is formal or informal, however, careful needs assessment outside a specific program of workshops tends to be neglected. While many teachers are no doubt quite conscientious in selecting and attending appropriate workshops, there is often no mechanism for monitoring teachers' choices and ensuring that they will result in the specific improvement in instruction required to prepare students for the world of work.

- Provision is frequently but not always made for released time and reimbursement of expenses for workshop attendance. Such provision may be one component of a formally organized program of workshops. State department of education workshop programs, for example, may include funds to reimburse teachers for travel expenses and to reimburse institutions for substitute teachers, allowing attending teachers to be given released time. These reimbursements are often automatic in such programs. On the other hand, provision for released time and reimbursement of expenses may simply consist of a general professional development policy statement in which workshops are listed as one of a number of activities similarly treated. In such cases, the ability of the institution actually to provide money and time for teachers to attend workshops depends on availability of funds. Furthermore, many states today prohibit reimbursement for any out-of-state travel because of budgetary constraints.

- Workshops may be brought into a given vocational education institution, or teachers may travel to the workshops. When a formal program of workshops is orgranized by an individual school, college, or district, the workshops are usually given on-site (or in town in the case of district programs). Workshop programs organized by teacher education institutions, state departments of education, or professional organizations are usually given at one or more central locations relatively accessible to all prospective participants in an effort to equalize the time and cost required to travel. Of course, there are no generalities to cover the location of workshops selected and attended by teachers on their own initiative.

It is helpful to differentiate workshops from one other approach to technological update—industry training or updating programs. Like workshops, industry training and updating programs are relatively short training sessions specifically targeted in terms of content and audience. However, industry programs are even more specifically geared to content than general workshops, usually focusing on a specific product or products manufactured by the business or industry involved. Furthermore, the intended audience for industry programs is mainly business and industry personnel, not vocational educators. While many such training programs gladly accommodate vocational instructors, their primary concern is the knowledge and skills of their own in-house staff.

Advantages and Disadvantages

Nature of Instruction. One significant advantage of workshops is the nature of instruction available to vocational/technical teachers in need of update. Such instruction usually is (and is perceived to be) very specific in nature and oriented to the development of skill as well as knowledge. The specificity and dual dimension of the instruction offered have the advantage of focusing teachers' attention more closely on their own specific objectives in attending the workshops. Thus, it is more likely that the activity will give teachers the opportunity to gain the particular knowledge and skills related to the latest technological developments in their fields.

A further advantage of workshops is that they typically tap one of the best possible sources of expertise—business and industry personnel involved in the daily application of technology. This helps to ensure that the instruction available in workshops reflects the actual practice and application of the technology in the specific field. Who could know better what knowledge and skills are required for the latest technological devlopments than someone who is involved with those developments every day?

Content coverage. There is, however, one disadvantage to the use of workshops as an approach to technological update. The relatively small amount of time spent in a workshop means that only a relatively small amount of content can be covered. While this disadvantage can be minimized by implementing a comprehensive program of workshops, the fact remains that a single workshop may provide only partial coverage at best.

Barriers and Facilitators

Attitudes. Teachers' attitudes toward workshops can be either a barrier or a facilitator in the use of this approach to providing technological update. Many vocational teachers find the relatively informal, task-oriented nature of workshops very much to their taste; they participate in workshops willingly and even enthusiastically. The opportunity for personal interaction, group activities, and hands-on practice of technological skills appeals to many teachers far more than the ordered formality of a university classroom, for example.

Other vocational teachers, however, have a different reaction to this particular learning situation. These teachers may prefer individual work to group work, with as little personal interaction as possible during a learning activity. In addition, the intensive use of workshops as an inservice activity in recent years has simply made some teachers tired of the approach—perhaps they feel they've been to enough workshops in the past ten years and would just like to try some other form of activity.

Currency and level of expertise. The currency and high level of expertise of workshop instructors generally act as a facilitator in the use of this approach. Most vocational teachers want to acquire knowledge and skills relating to new technology from those who work with that technology in business and industry. They feel that going to such sources helps to ensure that the instruction they provide for their own students will be most appropriate to students' preparation for the world of work. This positive effect, of course, encourages many teachers to seek update through this approach.

Money. As with almost any other approach to technological update, the availability of resources either impedes or facilitates the use of the approach. When a formal program of workshops based on a careful needs assessment is implemented, time is needed to administer the program and money is needed to fund it. Careful organization and implementation are required to get the most effective results, yet lack of funds can prevent this approach from reaching its full potential.

On the other hand, workshops are often seen as a very cost-effective approach to providing technological update to large numbers of vocational teachers. In all likelihood, the amount of money required to reimburse one or two teachers for university or college course tuition could be used to fund a workshop in which twenty teachers could participate. With tighter and tighter budgets forcing vocational administrators to become more cost-conscious, the possibility of reaching more teachers through this single activity becomes more appealing.

Lack of resources is not, however, quite so great a barrier to the use of this approach as it is to others. As discussed previously, administrators are increasingly unable to provide released time and reimbursement funds for update activities. When this occurs, the relatively low cost of workshop attendance in time and money leads many teachers to prefer this approach over others. Compared to work experience internships and university or college course work, for example, the amount of their own time and money that vocational teachers need to invest in order to gain update through this approach is small.

Policy. As might be expected, policy also acts either as a barrier or as a facilitator. When state recertification requirements or institutional professional development policies assign high relative weight to participation in workshops, teachers are more likely to attend workshops. If low relative weight is assigned, teachers become less likely to attend. As a general rule, however, policy facilitates the use of this approach by assigning a reasonable and realistic weight to the activity.

Specific Program Descriptions

Following are some examples of recent programs of workshops offered by various institutions and agencies.

Ferris State College in Big Rapids, Michigan, has sponsored a series of workshops since 1975 with a dual purpose: for teachers to obtain technological update and, at the same time, gain knowledge and skill in instructional design principles and practices for a specific teaching need. Coordinated by two of the college's schools (Technical and Applied Arts, and Education and Learning Resources), the workshops at first addressed the needs of autmotive teachers. In 1980, a new workshop concentrated on alternate energy—solar systems and heat pump technology.

A team teaching approach is used in the workshops; technical content experts are teamed with instructional design personnel to produce a balanced instructional staff, with additional support personnel having expertise in various aspects of media. (The instructional design approach taught in the workshops is heavily mediated.) Workshop activities include informational activities covering both technical and instructional design content and hands-on activities for both content areas as well.

From the beginning, the decision was made that the workshops should be self-supporting. The cost of the first workshop was budgeted at $3,000 plus services. One half of the cost was provided by the Ferris State central administration, the other half by the School of Technical and Applied Arts. Services were furnished by the School of Education and Learning Resources. In addition, workshop participants were charged tuition for the program: $250 for undergraduate credit, $328 for graduate credit. This tuition fee did not include lodging or travel expenses, which were also borne by participants. Revenues generated by tuition fees in excess of costs were to be turned over to the college.

Participant evaluations of the first workshop were highly favorable. High satisfaction was reported with the overall course, the introduction to the technical topic, the presentation of technical content, and the comprehension of the technical content. Good ratings were obtained on the evaluation of the instructional design components of the workshop as well.

Given these excellent evaluations, it was decided to offer other workshops in the automotive area. Responsibility for coordination and leadership in the workshop progrm was assumed by Ferris State's Office of Continuing Education. The first workshop had covered automotive electrical chassis and accessory systems in 1975 and was repeated in 1976. Workshops on electronic ignition were offered in 1976, 1977, and 1978; on automatic transmissions in 1977; on emission systems in 1977, 1978, and 1980; and on fuel and carburetion systems in 1979. In all, a total of 236 participants have been served by the automotive workshops and an equivalent of 828 undergraduate quarter credit hours have been generated.

Evaluations and recommendations of participating teachers reached the Vocational-Technical Education Services Office of the Michigan Department of Education. As the workshops continued to receive high ratings from participants, this office decided to endorse the program as an appropriate expenditure of vocational education funds for professional development. From that point, such an endorsement was printed on promotional brochures announcing future workshop offerings.

In 1980, funding was obtained from the Education Program Division of the Office of Consumer Affairs, U.S. Department of Energy for a workshop in a new technical area: alternate energy. Specifically, the workshop covered solar systems and heat pump technology. The grant award was for $20,000, with $5,000 in matching institutional funds supplied by Ferris State itself. Given the level of funding, the thirty participants in this workshop were provided a modest stipend. Participant evaluations of the workshop were as favorable as those of earlier efforts in the automotive area. Ferris State's newly organized Center for Occupational Education, in collaboration with the Office of Continuing Education, is currently planning to reinstate a similar series of activities during coming months.

The College of Agriculture and Home Economics of The Ohio State University has offered a program called "Technical Update of Teachers of Vocational Agriculture" every summer since 1980. The program is coordinated by the Department of Agricultural Education within the college and draws upon the expertise of all the departments of the college in its efforts to bring high school vocational agriculture teachers up to date with current science and technology in the various areas of agriculture.

The program is divided into two-hour blocks called *modules* and is organized so that teachers can attend three of these two-hour modules each day. (As an exception, the 1982 Technical Update program was combined with the Annual Conference of Ohio Vocational Agriculture Teachers into a three-day meeting. The Technical Update part of the agenda allowed teachers to attend five two-hour modules over two days' time.) Most of the workshops in the program are allotted a single two-hour module, although some sessions with more content to cover are alloted two two-hour modules.

The content for the program's activities is identified through a needs assessment process involving both vocational agriculture teachers throughout the state and the departments of the College of Agriculture. Preliminary input is sought from the various departments of the college, which are asked to identify new areas of technological knowledge and skills and their own perceptions of teacher update needs. This preliminary information is organized into a needs assessment instrument and sent to all vocational agriculture teachers in the state. Teachers respond to the instrument, suggesting other content coverage as they deem necessary. A planning committee appointed by the dean of the college collects, analyzes, and distributes the results of the needs assessment survey; each department of the college then begins preliminary planning for the segments of the program that it will offer.

The planning committee also identifies twenty-five exemplary vocational agriculture teachers from throughout the state to serve as consultants in the planning effort. These teachers are brought to the Ohio State campus and assigned to work with individual departments, where they review the tentative plans. Each department finalizes its offerings on the basis of this teacher review, and the overall schedule is produced.

The Technical Update program is promoted by a direct mailing to all vocational agriculture teachers in the state. A catalog containing the agenda of workshops and registration forms is sent out in the mailing. Teachers are required to register in advance and to pay a $10.00 registration fee. In addition, there is a special fee for certain activities to cover extraordinary expenses (e.g., supplies and consumables). Program administrators report that those who register almost invariably attend the program, probably because of the registration fee payment in advance. Occasional unregistered teachers do appear on the first day of the program and are registered at that time.

Instructors for Technical Update program activities are for the most part faculty members of the sponsoring departments of the college. Occasionally, business or industry personnel are brought in as consultants for activities. Except for instructor time, the program is self-supporting; the registration and special activity fees cover all other expenses (e.g., reference or instructional materials distributed in modules, supplies, consumables). No university credit is given to participants for program activities.

Teacher participation in the Technical Update program is reported to be high. In 1980, 62 percent of Ohio high school vocational agriculture teachers registered for the program; in 1981, 52 percent. Furthermore, in both years teachers attended an average of five modules throughout the course of the program. (Program and module attendance figures for 1982 were unavailable at the time of this writing.) The program in 1980 consisted of fifty-one individual workshops; in 1981, fifty-six workshops; and in 1982, sixty-three workshops.

Finally, participant evaluations of Technical Update workshops indicate high levels of satisfaction with the workshops. Evaluation is sought on the relevancy of workshop topics, the usefulness of subject matter content, the provision of scientific and technical knowledge, and the appropriateness of activities to teachers' update needs. In sum, teacher responses lead to the conclusion that Technical Update workshops have been timely, of high quality, and relevant to the needs of teachers. In both 1980 and 1981, approximately 90 percent of participating vocational agriculture teachers indicated that they would recommend future Technical Update workshops to other teachers of vocational agriculture.

The Pennsylvania Department of Education operates a program of Technical Updating Workshops. The need for technological update of vocational/technical teachers was first established through a survey completed in September 1980. This statewide survey was carried out by the state Occupational Competency Assessment Coordinator (OCAC). Copies of the survey form were distributed to each director of vocational education in the state; directors were asked to pass on the survey forms to all members of their staffs and return the completed forms to the OCAC. More than 1,500 vocational teachers responded to the survey by recording their own perceptions of their needs for technological update.

Upon completion of the statewide survey, state department of education personnel decided that it would be appropriate to organize, plan, and conduct a program of technological updating workshops for teachers throughout the state. This program was initiated through the four established Vocational Education Professional Development Centers in the state. (These four centers are located at Indiana University of Pennsylvania, Indiana; The Pennsylvania State University, University Park; University of Pittsburgh, Pittsburgh; and Temple University, Philadelphia.) The centers had originally been established to provide basic funding and vocational teacher education; each Center is responsible for serving the needs of vocational teachers in its own geographical area.

The results of the teacher survey were used as a basis for establishing program priorities and content for the first series of technological workshops, initiated through the centers during the 1980-81 school year. The first workshops were offered in the spring of 1981 at different locations throughout the state. Workshops lasted from two to five days, with academic credit available for attendance at all workshops. (Teachers who wish academic credit for workshop attendance must pay appropriate fees; otherwise, participation is free.)

Resource persons were recruited from business and industry to provide instruction or assist in offering the workshops, as necessitated by occupational requirements. During the first year of the workshop program, stipends were offered to teachers. Reimbursement was also made to school districts to help them defray the costs of participant travel and of salaries for substitute teachers hired to allow participating teachers released time. Workshops for the 1981-82 school year followed the same procedure, except that stipends were eliminated.

Workshops in the first year's program concentrated on the technical and trade and industrial program area. The second year's program included several workshops in the business and health areas. Program personnel noted, however, that participation in and support of the program by vocational teachers were less than satisfactory, even with careful planning by administrators and teacher education personnel. As a result, some revisions were made after the first year's program of workshops. Among these revisions, some scheduling difficulties were addressed, so that during the second year, more sessions were scheduled for spring, summer, and weekends in an effort to minimize the released time teachers needed in order to participate. However, in the opinion of program personnel, those changes did *not* help overcome low participation and support.

It is felt that a solid dissemination system has been established to promote the workshop program. An effort has been made to involve CETA prime sponsors, although their response has been minimal. One possibility noted is that administrators may not be forwarding all promotional materials to teachers. Furthermore, it is felt that eliminating the stipends paid to teachers did not have significant impact upon participation and interest.

Participant evaluations of the workshops have consistently indicated that the training received was of high quality and useful to teachers. The highest participant evaluations were received for workshop sessions that offered hands-on training with industrial trainers as opposed to informational sessions with trainers not directly involved in skilled operations.

Industry Observation

Visiting and observing business and industry sites is a commonsense approach to updating knowledge and skills in new technology. Logic indicates that one excellent way of finding out what the technology of a field is and how that technology works is to go into the work place and see it.

Administrative Characteristics

This approach to technological update of vocational/technical teachers commonly functions in the following manner:

- Instructors visit a business or industry site employing workers in the occupations for which they train students. At the site, instructors observe new technology in place and in operation. This allows instructors the opportunity to identify the knowledge and skills needed to prepare students for the technology of the world of work.
- Industry observations tend to be of short duration, lasting from one to five days.
- The selection of sites to observe is generally informal and loosely controlled. Instructors largely use their own judgment, experience, and knowledge of local employers, often with input from advisory committee members, to identify appropriate sites to visit.
- Instructors may or may not be provided with released time for industry observations. Some institutions are willing and able to pay for substitute instructors, allowing the visiting instructor to carry out the observation during normal teaching hours; others require instructors to observe on their own time—during evenings, weekends, or vacations. Reimbursement for travel also varies.

Industry observation differs from work experience internships in the length and nature of the experience. Observations are of shorter duration than internships and hence do not allow for the acquisition of as much content. Furthermore, observation—as the very name implies—provides participating instructors the opportunity only to acquire *knowledge* of new technology and its application and use in the work place. Instructors do *not* go on to develop skill in using the technology themselves, as is the case in work experience internships.

Advantages and Disadvantages

Nature of Instruction. The advantage of industry observations is that they give instructors a firsthand look at technology in place and in operation in the world of work. Instructors can acquire knowledge about technology and its use from the best possible source for their purpose—the actual business and industry sites at which their students hope eventually to be employed. It would be difficult to overstate the importance of this factor to instructors seeking update of their technological knowledge and skills.

On the other hand, the nature of the activity limits its effectiveness in providing update to instructors. While observation may provide instructors with knowledge of technology and its use from the best possible source, its usefulness ends there. It does not allow instructors to develop skills in the operation and use of the technology in question. This limitation may be acceptable to some instructors—that is, those who need only to teach their students *about* technology. It cannot, however, be acceptable to any instructor whose students themselves need to acquire up-to-date technological skills required in the world of work.

Site selection. The relatively informal and loose control of site selection for industry observation can be a disadvantage in the use of this approach. Many teachers will, of course, formulate their own specific goals and objectives for an observation and ensure that the site they select will allow them to meet these goals and objectives. However, others will tend to think in general and unspecific terms when selecting a site; the general lack of administrative checks often allows this lack of focus, resulting in the possibility that teachers observe sites and practices that are minimally relevant to their own update needs.

Barriers and Facilitators

Policy. As with other approaches to technological update, there are barriers and facilitators to the use of industry observation as a means toward update. Policy, for example, can be either. If industry observations are assigned a high relative weight for the purposes of professional development or recertification, teachers will naturally be encouraged to carry these out. Assignment of lower relative weight will naturally lead teachers to choose other means of update.

Money. Availability of resources is a less critical barrier or facilitator in industry observation. Released time is not as commonly provided for this activity as it is for others and so does not as commonly need to be backed up by funds for substitute teachers. Teachers are usually expected to carry out this activity on their own nonteaching time, lessening the impact of scarce resources.

Motivation. Since industry observation is often done on teachers' personal time, teacher motivation becomes more important as either a barrier or facilitator. The activity does not require a great amount of motivation, since it is, after all, fairly short and easy. If teachers feel no motivation, however, they are not likely to make visits to industry in order to observe.

Specific Program Descriptions

The State of Connecticut operates a school counselor business/industry internship program in conjunction with two higher education institutions in the state: Central Connecticut State College, in Hartford, and the University of Bridgeport, in Bridgeport. The program operates for the benefit of school counselors and allows them the opportunity to observe the actual work settings in which their students might eventually be placed and to participate in the work that is performed in those settings. This gives counselors greater insight into the world of work and allows them to do a better job of counseling vocational students.

The Connecticut Department of Education was involved in the original conceptualization of the program and standardization of activities between the two teacher education institutions. At present, the state department is responsible for promoting the business/industry internship program among school counselors and receiving their applications for admission into the program. Actual admission into the program is handled cooperatively between the two institutions and the state department. Each institution then operates its own component of the program once counselors are admitted. In practice, each institution serves counselors primarily in its own area of the state—Hartford is in the north-central part of the state, Bridgeport in the southwest. This geographic division is not formalized, however. All school counselors in the state are eligible to participate in the program at either institution.

The program operates over two semesters (summer and fall), with each semester's work being worth three graduate credits. The summer semester component comprises the actual internship experience. Counselors are required to spend 120 hours at a local business or industry over a period of six weeks. There is some flexibility in relation to spreading the 120 hours over the six weeks, the essential condition being that the 120 hours of internship activity occur during the six-week period. Beyond that, the counselor and host site are free to determine how the time is to be spread.

What the counselor actually does at the host site during the internship experience is left to be determined by agreement between the counselor and the host business or industry, with a single stipulation: one-half of the time—that is, 60 hours—must be spent in actual work representative of the host site's activities. If, for example, a counselor is placed in a retail business, the 60 hours of actual work might be spent in customer service and sales—waiting on customers in person and over the telephone, making sales, handling complaints, and so on. The other half of the 120 hours can be spent in observation of host site activities, other hands-on work, special project work, interviews with employees, or whatever can be agreed upon by the counselor and the host site.

Placement of counselors in business and industry sites is the responsibility of the two cooperating institutions. This activity is coordinated by faculty members at each institution with the help of a community organization in each city. Central Connecticut State College is assisted in this task by the Greater Hartford Chamber of Commerce, and the University of Bridgeport by the Greater Bridgeport Personnel Managers Association.

One interesting feature of the Connecticut program is that counselors are paid for their participation in the activity. The state pays each counselor a stipend of $50.00 a week, which is matched by the host business or industry. In addition to this basic stipend of $100.00 a week, the state will pay an additional $25.00 a week to each counselor for such expenses as travel associated with the activity. Stipends are paid only during the six-week business/industry internship.

The fall semester component of the program consists of a seminar at the coordinating teacher education institution. The seminar is led by the faculty member who coordinated the site placement process. In the seminar, counselors must prepare an actual project for eventual use with students in their school. They also meet in class sessions to discuss career guidance issues and share the work site experiences.

Central Piedmont Community College in Charlotte, North Carolina, conducted a special project in 1980—Project Upgrade: Current Practices Observed in Electrical-Electronics Engineering Technology. The purpose of the project was to identify the technology and technological practices currently in use in local electrical-electronics industry.

Project Upgrade was a one-time activity, made possible largely by the generosity of the IBM Corporation, which provided financial support for the activity. These funds were used by Central Piedmont to pay substitute teachers so that three full-time electronics instructors could be given released time from one third of their class load. The activities of the project were then conducted during this released time. IBM also furnished funds to pay for the printing of 500 copies of the project results to be distributed to electrical/electronics instructors across North Carolina and the nation.

Relevant technology and technological practices in local industry were identified through two means: observation and interviews. Instructors visited sixteen local firms that employ graduates of Central Piedmont's electrical/electronics programs. The first step was for instructors to contact the firms in question and obtain their agreement to participate in the project; dates and times for observation and interview sessions were also scheduled. A standard instrument was used by the instructors to promote consistent collection of data. In all, the current work practices of 699 engineers, technicians, and support personnel in the sixteen participating firms were surveyed.

The survey effort concentrated on identifying the following seventeen survey factors for each firm:

- Company
- Occupational area observed
- Nature of work in area observed
- Number of employees in area observed
- Equipment used by technicians
- Most common types of components used
- Circuit level at which technician work is performed
- Types of documentation produced by technicians
- Resource material used by technicans
- Basic functions of technician's job
- System of work organization
- Job classifications
- Hiring practices
- Training practices
- Promotion practices
- Physical facilities
- Factors of significance to Central Piedmont Community College

The work of Project Upgrade was spread over three academic quarters to minimize the impact of using part-time substitute teachers in place of the full-time instructors. The full-time instructors were thus provided one-third released time for each of the three quarters that the project lasted.

Education And Industry Staff Exchange

One means of providing technological update to vocational/technical teachers is an exchange of personnel between vocational education institutions and business or industry. The teachers involved have the opportunity to reenter the work place and gain needed technological knowledge and skills; the business or industry personnel have the chance to teach a vocational course. All sides can benefit from such an exchange of staff.

Administrative Characteristics

- As implied in the name, the first characteristic of a staff exchange is the exchange of personnel between a school or college and a business or industry. The vocational teacher assumes the job position of the business or industry person, actually performing the functions and duties of that job, while that person takes over the teaching duties of the vocational teacher.

- Once the exchange of staff has been set up, each person involved actually does the work of the other. The teacher performs the functions and duties of the industry position he/she is filling. The industry person actually teaches in the program of the participating teacher.

- Each employer—the vocational education institution and the business or industry—undertakes the responsibility for providing the exchange personnel with the opportunity for meaningful involvement in its own operation. These undertakings are often expressed in formal written agreements between the two employers. One feature of such agreements is frequently a promise by the business or industry to allow the participating teacher access to production technology and a promise by the teacher to respect the confidentiality of such information. Also, such agreements usually address legal concerns associated with the exchange—the effect of contracts with labor unions, licensure and safety issues, and liability insurance coverage, for example.

- Arrangements are generally made in each individual case for continuation of salary and benefits for the personnel involved in the exchange. The most common practice seems to be that each original employer continues to pay the regular salary and benefits of its own employee, provide worker's compensation coverage, and so on. Each employee officially remains an employee of the original employer, while being treated fully as an employee at the exchange site. Generally, the exchange between the two employers is one of services only.

- This exchange of personnel between vocational education and business or industry can last from two weeks to an entire academic quarter. In general, the length of a given exchange is fixed in the agreement between the two employers.

- Some vocational education institutions provide fairly close supervision and monitoring of the exchange experience for their teachers. Practice varies from one school to the next, but this process can begin with an assessment of the teacher's specific need for updating and the development of stated objectives for the exchange experience. From that point, supervision may extend to visits to the exchange site by an administrator for periodic checks on progress and performance.

- Input is often sought from advisory committee members in identifying business and industry sites with which a staff exchange would be appropriate.

- Since the participating teacher is filling an actual job position at the exchange site, he/she has the opportunity to acquire both knowledge and skills in the technology and its applications. Exchange sites can be counted on to have the necessary physical plant and facilities, since they are engaged in work involving the technology in the first place.

The education and industry staff exchange shares common features with other forms of technological update. Like work experience internships and part-time employment, it involves a return by teachers to the work place with the object of filling a regular job position and gaining experience in working with the technology in question. All three forms present teachers with the chance to acquire both knowledge and skills. In addition, staff exchanges and work experience internships are similar in that teachers are released from their regular teaching duties for the duration of the activity.

The feature that differentiates staff exchanges from these two other forms of technological update is the exchange component. A vital part of the staff exchange is that the cooperating business or industry sends one of its employees to replace the teacher in his/her teaching duties or some significant portion of them. In this respect, the staff exchange is an instance of a truly collaborative relationship between vocational education and local business and industry.

Advantages and Disadvantages

Nature of Instruction. As with other appproaches to technological update that involve return to the work place, the main advantage of staff exchanges is the nature of the instruction and expertise available to the teacher. The business or industry personnel from whom the teacher acquires technological knowledge and skills are in the best possible position to know the actual functioning of the work place. Furthermore, the business or industry site will naturally have in place the tools, machinery, and equipment that comprise the technological application. Hence, the activity is well suited to the update needs of many vocational teachers.

An additional advantage of staff exchanges is that they can last long enough for the teacher to absorb a fairly large amount of content in the technology. Even with a short-term exchange (e.g., two weeks), the experience is intensive enough to allow the teacher to become well grounded in knowledge and skills related to one segment of the technology.

Change of Instructor. There is also an advantage for the vocational program in staff exchanges. The industry person who temporarily assumes teaching duties may bring specialized technical knowledge and skills to the vocational classroom or laboratory. This knowledge and skill may permit the coverage of content not ordinarily included in the program curriculum, if appropriate. On the other hand, this advantage may be offset by the disadvantage that industry personnel have not usually had training and experience in vocational teaching. There is the further disadvantage that, regardless of the industry person's teaching skills, students must adjust to a disruption in instructional routine—a new teacher with a new style and a new approach.

Quality of Instruction. The quality of instruction in technological knowledge and skills provided to the participating teacher can also be problematic. As noted previously, business and industry personnel are not generally educators; it is simply not their line of work. There is always the chance that a teacher will be unlucky in the assignment of personnel with whom he/she is to work at the exchange site.

Barriers and Facilitators

Money. The most commonly quoted barriers and facilitators to approaches to technological update do not seem to affect the use of staff exchanges as greatly as they do the other approaches. The availability of resources (primarily money to reimburse occasional expenses and provide released time and substitute instructors) becomes rather a moot point with staff exchanges. Since in a staff exchange the vocational school or college and the participating business or industry simply trade the services of employees, no direct outlay of funds is required in implementing this approach.

Policy. Policy also acts somewhat differently as a barrier or facilitator with regard to staff exchanges. In many approaches to technological update, policy is only a barrier or facilitator in *relative* terms: one update activity is assigned a high relative value and another a low relative value, so that teachers are more likely to opt for the one with the high relative value. However, in relation to staff exchanges, policy is likely to be either a barrier or a facilitator in *absolute* terms. A vocational teacher cannot simply arrange for an industry person to come in and take over his/her classes regardless of the school or college policy. Such an arrangement can only be undertaken with the permission and support of administrators. Policy, then, is most likely not to help or to hinder but rather to allow or forbid the use of this approach.

Administrative support. Related to the absolute effect of policy on the implementation of this approach is another factor: administrative support. Even if policy allows staff exchanges to occur between the vocational education institution and business or industry, exchanges will not occur unless administrators support them in word and deed. The sometimes complex administrative arrangements of the exchange require that someone spend time and energy on them. A vocational department head or an experienced teacher must be willing and able to take the industry person, like any other new instructor, under his/her wing. If the participating teacher's experience in the work place is supervised or monitored, this also demands time and effort on the part of a supervisor or administrator. If administrators and supervisors lack the time and the motivation to provide this kind of support, teachers are less likely to put effort into the approach themselves.

Relationship between vocational education and business and industry. Finally, the nature of the relationship between vocational education and local business and industry can either help or hinder the implementation of staff exchanges. As is the case with other approaches involving business or industry, fruitful cooperation is more likely to occur when it is based on a strong relationship of mutual trust and knowledge. The cooperating business or industry must know and value the benefits to itself of the staff exchange. It must appreciate and accept the needs and motivation of the school or college in seeking to carry out a staff exchange. If the relationship does not include this mutual knowledge, trust, and appreciation, the likelihood of staff exchanges occurring becomes slim.

Specific Program Descriptions

Orangeburg-Calhoun Technical College in Orangeburg, South Carolina, operates a personnel exchange program with local industries. The college recognizes instructors' needs to gain knowledge and skills related to technological developments in their fields; further, it recognizes that these needs must be met if the community in which both the college and the industries are located is to enjoy continued economic growth and development. The personnel exchange program has two stated objectives:

- To provide instructors of the institution an opportunity to enter industry and become involved in its operation on a short-term basis
- To provide key industry personnel an opportunity to enter an educational environment at the instructor level and become involved in its operation on a short-term basis

The exchange of personnel, which forms the core of the program, can last different lengths of time, depending on the nature and complexity of the operations to be observed at the industry site. One exchange cited by the college lasted for two weeks; another, for approximately eight weeks. The exchange of personnel is a matter of formal, written agreement between the two parties. The written agreement specifies both the educational and industrial personnel to be involved in the exchange. It also names starting and stopping dates for the personnel involved to fulfill their duties at the exchange site.

The written agreement states that the instructor will have access to the design and production technologies of the host industry. A caveat is inserted promising that the instructor will respect any confidential trade information to which he/she is exposed during the exchange program. The agreement specifies that the instructor will be assigned a work area like any other employee. Finally, the agreement is signed by the chief administrative officers of the college and the business or industry, as well as by those directly involved in the exchange.

The duties of the industry personnel at Orangeburg-Calhoun are also stated in the agreement. The particular course, or portion of a course, that the industry person will teach is named, with the stipulation that the industry person will give instruction in the content of the course as indicated in a course outline to be furnished by the college, under the direction of the head of the department that offers the course.

According to the terms of the agreement, each person involved in the exchange program remains an employee of his/her original employer: the instructor remains an employee of the college; the industry person, of the industry. During the course of the exchange, however, each person is to have all the rights, privileges, and responsibilities of the institution to which he/she is temporarily assigned. Insurance protection, unemployment compensation, and other employee benefits are to be maintained for each employee by the original employer for the duration of the exchange.

Finally, the two exchanging employers agree that there will be no exchange of money involved in the exchange program. Each employer will continue to pay its own employee's salary while that employee is involved in exchange activities. The exchange of services between the college and industry will be one of barter only.

Since the first exchange took place in the fall of 1979, there have been three other exchanges between personnel of the college and local industries. At the time of this writing, another instructor is scheduled to be involved soon in an exchange. "After action" evaluation reports, which participating instructors are required to file, have been enthusiastic and favorable in evaluating the exchange experience. Further, the exchange program is quite well received in the local community. The first exchanges were carried out with industries that were members of the college's advisory committee; once word of the exchange program spread, however, other industries exhibited interest in participating as well. Overall, college officials report that the community and local industry have been most cooperative in the personnel exchange program.

Part-Time Employment

It is well known that many vocational teachers assume teaching duties for only nine of the twelve months of the year. In addition, the nine-month academic year is punctuated by vacations of some length—Christmas and Easter in secondary schools, quarter or semester breaks in postsecondary institutions. Finally, for many teachers, the teaching day is finished by three o'clock.

All in all, teaching duties leave many vocational teachers with some amount of time to devote to professional purposes. One use to which this time can be put is part-time employment in business or industry. Such employment in the teacher's own technical field can provide the opportunity for technological update.

Administrative Characteristics

As an approach to technological update, part-time employment usually works in the following manner:

- Teachers identify a business or industry in their own technical field and seek and obtain part-time employment with that employer.
- The part-time employment that teachers obtain takes place during nonteaching hours. This may be during the evening, on weekends, during vacations that occur within the academic year, or during the summer vacation of the nine-month year. Most common, however, is part-time employment during the summer vacation.
- The employment sought is a regular position with the business or industry. The participating teacher functions on the job just like any other part-time employee of the firm, with stated job tasks and responsibilities; teachers receive pay as part-time employees according to company practice and policy.
- The work experience provided in part-time employment is not formally designed as an instructional experience. However, many teachers, in seeking this employment, reveal their motives and purposes—that is, technological update—to the business or industry involved, who then may cooperate with that intent by placing the teacher into an appropriate position. The fact remains, however, that the teachers fill a standard job position, are responsible for the work of that position, and are paid for it. It is in this assumption of the normal role of employee that teachers find opportunity for updating their technological knowledge and skills.
- Depending on the nature of the specific position obtained, the teacher may have the occasion to develop both knowledge and skills related to current technology. In fact, it is more likely than not that the teacher will fill a position that involves both knowledge and skill in technological applications.
- Since part-time employment takes place during nonteaching hours and teachers are paid for their work, teachers are not usually recompensed for their time and effort by educational authorities. Released time is unnecessary; reimbursement for the usual occasional expenses of update activities is generally not even offered. By and large, teachers participate in this form of update activity on their own initiative and motivation.

Part-time employment differs from other approaches involving teachers' return to the work place. It differs from industry observation in the nature of the experience; teachers not only observe but also practice the technology in question in part-time employment. It differs from work experience internships in that the latter are specifically designed as instructional experiences, while part-time employment is only indirectly so; work experience internships also necessitate the provision of released time for the participating teacher and funds for substitute teachers. Furthermore, work experience internships are often a matter of formal written agreement between the cooperating business or industry and the vocational education institution. Part-time employment, on the other hand, is most often entirely between the teacher and the business or industry involved.

Advantages and Disadvantages

Nature of Instruction. The greatest advantage of part-time employment as an approach to technological update is that the instruction provided comes from the best possible source of expertise—an actual business or industry site at which the technology is applied and used. Once again, the particular businesses or industries at which students might eventually be employed are the best places to find out what knowledge and skills students will need and to gain such knowledge and skills.

Part-time employment also provides the opportunity for instruction in either knowledge or skills or both. The source of expertise is good and appropriate; the nature of the site is such that physical plant and equipment are available for practicing the skills required in their use. Finally, the nature of the participating teacher's status at the training site—a regular worker in a regular job position—not only allows but actually requires that the teacher gain the knowledge and skills necessary to do the job.

Content of Instruction. One disadvantage of part-time employment as a means of technological update is that the content of instruction is dictated by the job position that the teacher is able to obtain. The knowledge and skills that the teacher can acquire will be those used in the particular position. Furthermore, the loose administrative control of part-time employment lessens the likelihood that teachers will carefully and seriously assess their own update needs. All in all, the appropriateness of the content of instruction in part-time employment can be problematic.

Barriers and Facilitators

Money. Given that part-time employment is generally carried out on teachers' own nonteaching time, availability of resources does not usually act as either a barrier or a facilitator. Schools and colleges are not required to provide released time for the activity or substitute teachers to fill the participating teacher's teaching schedule. Nor are funds generally required for reimbursement of occasional expenses when teachers seek and obtain part-time employment.

Policy. Policy, however, operates in the expected way as either a barrier or a facilitator to the use of the approach. As a rule, part-time employment is treated much like work experience internships in recertification or professional development policies. The same relative value is likely to be assigned to hours spent in part-time employment as those spent in internships. This relative value then becomes either a barrier or a facilitator, depending on how it compares with the relative value assigned to other activities for recertification or professional development purposes.

Motivation. Much more important as a barrier or facilitator is teacher motivation. Motivation assumes added importance in part-time employment because teachers are more likely to engage in the activity on their own time and pay their own occasional expenses. The time required for part-time employment is probably the most critical factor for most teachers. It is, after all, only human nature to be reluctant to spend one's leisure time for work purposes. A considerable commitment to the teaching profession may be required to devote hard-earned evenings, weekends, or summer vacations to staying technologically current in the teaching field.

Relationship between vocational education and business and industry. The relationship maintained between vocational education and the local business and industry community can also help or hinder the use of part-time employment by teachers seeking update. If this relationship is a good one, employers will be more likely to be willing to hire teachers for part-time positions and to be sympathetic to teachers' goals of obtaining up-to-date knowledge and skills in the technology of the field. Employers will more often know and value the long-term benefits to themselves of teachers' efforts to bring themselves abreast of current technological practices. If, on the other hand, this relationship is poor, employers may see part-time employment of vocational teachers as an imposition and as being unresponsive to their own needs.

Availability of part-time positions. Finally, the state of the economy and the level of unemployment at the present time act as a barrier to part-time employment for technological update. More and more employers are cutting job positions and curtailing their work force; more and more workers are unemployed and desperately seeking those same positions that could be filled by vocational teachers who need to update their technological knowledge and skills. The attitides of labor unions, naturally enough, may also discourage or prevent part-time employment of teachers in some businesses and industries. Regardless of teacher motivation and employer inclination, technological update is not possible through part-time employment when there are no part-time jobs available.

Specific Program Description

A new program was implemented in the state of Utah in the summer of 1982 for business and office occupations teachers. The aim of the program is to update teachers' technological knowledge and skills by placing them in summer employment at business and industry sites. Twenty-five teachers were selected from across the state to participate in the program.

Responsibility for managing the summer employment program was assigned by the Utah Office of Education to a resource person from Utah Technical College at Provo. The resource person supervised the placement of the twenty-five selected teachers at business and industry sites where they could perform work that related to their individual specific teaching responsibilities. Teachers were supervised in their work by regular employees of the host site. Each teacher had the goal of updating his or her own skills in the technology currently in place in the world of work and his or her knowledge of the needs of business and industry for workers trained in specific technologies. Teachers received regular pay from their host firms for the work they performed.

The program has received considerable support from business and industry throughout the state; all twenty-five of the teachers selected for participation were placed into host firms. In addition, more teachers applied for the program than could be accommodated in this first year of program implementation.

TYPES OF UPDATE PROGRAMS

Local Programs

Most of the efforts to provide technological update for vocational/technical teachers are undertaken in locally planned and operated programs. Such programs are put in place by an individual school, college, or district.

Administrative Characteristics

- In the case of local programs, the audience served is the teaching staff of the implementing school, college, or district. Depending on the size of the teaching staff, the effort may be subdivided by program areas.

- The local education agency must generally provide its own resources for a program of technological update activities. Funds for purchasing activities and time for administration of them and for teacher participation most often are earmarked in regular operating budgets. Occasionally, however, a given institution is able to procure special grant funds to operate a particular project to update its teachers technologically. As one example, the Appalachian Regional Council funded a return-to-industry program operated by a consortium of three South Carolina technical colleges for three years.

- The process of assessing teachers' specific needs for update tends to be less formal and methodical than is the case in nonlocal programs. In many instances, teachers are asked to discover by introspection their own content needs for update as part of the formulation of an individual professional development plan. In other instances, teachers are simply required to identify specific objectives to be fulfilled by a particular update activity they propose. In still other instances, teachers are not required to identify specific update needs at all—administrators simply accept on faith the appropriateness of proposed activities to teachers' needs. It is relatively uncommon for a given school, college, or district to survey the update needs of its entire teaching entire teaching staff, as is often done in nonlocal programs.

- Regardless of the nature of the needs assessment process, an individual school, college, or district does not usually provide the activities to update teachers' technological knowledge and skills. Far more commonly, the local agency indentifies the kinds of activities for which teachers will be allowed released time, reimbursement for expenses, and professional development or recertification credit. Teachers then work within this framework of officially recognized activities to identify and participate in activities on their own initiative. All in all, the "programs" of technological update undertaken by individual schools, colleges, or districts tend to be less programmatic than those provided by nonlocal agencies. In fact, many such local programs amount to nothing more than statements of policy regarding (1) teachers' responsibility to engage in professional development activities and (2) the administrative mechanisms by which such activities are handled and recognized.

- The kinds of activities that teachers choose within local programs of technological update are numerous and varied. Almost any of the individual delivery techniques discussed techniques discussed previously can be found in local programs; many programs allow teachers a choice of several officially recognized and reimbursable activities; some programs recognize all of the activities discussed. Many local programs consist wholly or in part of teacher participation in programs of update activities sponsored by nonlocal agencies.

- The process of identifying and selecting appropriate update activities tends, again, to be informal and unmethodical. Knowledge of such activities often depends on promotional efforts by the agency or the employer sponsoring the activity. Businesses and industries frequently publicize their training and updating events by mailing flyers to appropriate teaching staff. Administrators often receive announcements of appropriate activities to be passed on to the teaching staff. Some schools and colleges rely on their program advisory committees to apprise staff of opportunities for technological update. Advisory committee contacts are often most helpful in identifying business or industry sites to which teachers can return for work experience internships, observations, part-time employment, and so on. Professional and trade organizations also generally promote any update activities that they sponsor, as do state departments of education and teacher education institutions. Many local programs consist wholly or in part of teacher participation in programs of update activities sponsored by nonlocal agencies.

- Incentives are often provided—at least on paper—for teacher participation in update activities. Professional development policies commonly assign relative values to different kinds of activities, with teachers being required to accumulate a specified total value of such activities. Recertification policies—over which, of course, such local agencies have little or no control—often do the same. Reimbursement for direct and indirect expenses involved in teacher participation in update activities is almost universally allowed; some institutions also allow for substitute teachers, permitting released time for teacher participation as well.

- One frequently cited means of allowing teachers the time to participate in update activities is leave from duty—professional leave, industrial leave, sabbatical leave, and so forth. Under such leave arrangements, teachers may be allowed to take as much as one year off from their teaching duties to engage in appropriate long-term professional development activities. However, policy considerations and budget constraints often result in such leave being unpaid.

- Feedback on the effectiveness and appropriateness of individual update activities is less common in local programs because of the fragmented nature of the program as a whole. This is the case especially when individual teachers identify their own activities and participate in them as individuals. When an activity is brought into the school, college, or district for a large number of teachers or when teachers attend an out-of-school activity en masse, the likelihood is increased that feedback on the activity will be obtained.

The distinctive feature of local programs for technological update is, very simply, the locus of administrative control. Local programs are generally planned and carried out by administrators at the individual school, college, or district Input and involvement is often sought from teachers as well. The important point, however, is that the primary impetus and support for local program efforts to provide technological update come from those immediately concerned—the individual teachers and administrators of the schools, colleges, and districts.

Advantages and Disadvantages

Responsiveness. One advantage of local programs of technological update activities is that they can be very closely suited to the needs of individual teachers. Since very often individual teachers are responsible for identifying and selecting their own update activities within stated guidelines, they are usually free to pursue their own purposes in selecting specific update events.

On the other hand, the informal nature of the needs assessment process in local programs can result in teachers' selecting and participating in update activities without having clearly in mind their own needs for specific knowledge and skills. The appropriateness of the particular activities that teachers choose also enters into play; each of the delivery techniques discussed previously carries its own set of advantages and disadvantages with it.

A distinct advantage of local programs for technological update is that they are more likely to give teachers the chance to acquire new technological knowledge and skills in their own best way. Since teachers are often free to choose their own update activities, they can choose activities involving delivery techniques most appropriate to their own learning styles. However, the variety of options available in theory may be limited in practice by the availability of resources, facilities, and expertise in the local community.

Barriers and Facilitators

Money. The same kinds of barriers and facilitators that operate for or against specific delivery techniques for technological update also affect the implementation of local programs. First and foremost among these is the availability of resources. Any update activity that is actually organized and presented by a local institution or agency must be paid for, of course. When teachers attend out-of-school activities, someone must pay direct and indirect expenses. If the local institution has sufficient funds to pay for institutionally sponsored activities and to reimburse teachers for out-of-school activities, this greatly increases the likelihood of update occurring. If such funds are not available, the likelihood is lessened.

Motivation. Another possible barrier or facilitator is the motivation of teachers and administrators. Especially when funds for reimbursement and procurement of substitute teachers are scarce, teachers must be motivated to participate in update activities at their own expense and on their own time. Administrators must devote a certain of amount of time to tasks and duties of their own in the conduct of such programs. Even if the program consists of nothing more than statements of policy outlining teachers' responsibility for professional development, the commitment demonstrated by administrators can either discourage or encourage teachers' fulfillment of such responsibility.

In addition to the effect of these general barriers and facilitators at the program level, the barriers and facilitators to each of the delivery techniques used in the program, such factors as motivation, availability of resources, and policy, also apply.

Specific Program Description

The **Pomona Unified School District** in Pomona, California, uses various policies, practices, and procedures to keep its vocational teaching staff up to date with the current technology of the world of work. The overall effort begins with initial requirements for Designated Subjects Teaching Credentials, including an inservice training component. In addition, the district encourages teachers to participate in numerous staff development activities, promotes contact with and involvement of the private sector in vocational program planning, and maintains an up-to-date technological plant in its vocational program areas.

Credentialing requirements. The California Education Code stipulates that the minimum requirements for a teaching credential shall be (1) an equivalent of five years of recent and successful work experience in the trade or vocation named on the certificate, (2) a personalized inservice training program to provide appropriate pedagogical preparation, and (3) a high school diploma or its equivalent. Local educational authorities are charged with determining whether or not applicants for credentialing meet these requirements. Upon that determination, local authorities recommend teachers to the Education Commission for Credentialing.

Staff development activities. The district's staff development efforts center on the following areas:

- **Workshops**—Offered by various training sources, these are publicized and promoted at each school site. Examples include computer training workshops offered by the Los Angeles County School Resource Center; computer literacy summer workshops for business, office, and marketing education sponsored by the Center for Business Teacher Education of California State University at Los Angeles and the state department of education; and a programmer-operator training course for computer-controlled machining equipment offered by a local firm, Machinery Sales Co. Policy allows for substitute teachers and reimbursement of workshop and travel expenses.

- **Publications**—The district also subscribes to and circulates various technical, trade, and educational journals that keep teachers aware of current research and practices in pedagogy and the technology of their fields.

- **Work experience**—Many of the district's vocational teachers return to the private sector, especially part-time or during semester breaks, to gain firsthand experience in technological practices and trends in their fields. Some teachers register with personnel employment services, accepting temporary work assignments in their specialty areas as their teaching schedules allow. Another means of gaining work experience used by Pomona Unified teachers is summer employment at local businesses or industries. Likewise, some teachers simply obtain long-term part-time positions at appropriate business or industry sites and work a part-time schedule that fits with their school schedule.

- **Sabbatical leave**—District policy, as expressed in an agreement with the Associated Pomona Teachers, allows sabbatical leaves to be granted to members of the Associated Pomona Teachers by the board of education upon recommendation of the superintendent. Such leave may be not less than one nor more than two consecutive semesters and can be used for any one or combination of the following activities on a full-time basis:

  - Travel
  - Independent study
  - Formal study
  - Work experience related to the member's assignment

  Each of these four activities is more fully defined in the agreement between the board and the association. Members are eligible upon completion of seven years service with the district and receive 50 percent of their base salary during the sabbatical leave. Upon completion of the leave, members are required to submit a detailed evaluation of their leave activities, showing evidence that objectives stated in the application for the sabbatical leave have been met.

Private sector involvement and contact. Private sector contact and involvement is cited as another solid means of keeping teachers and their programs up to date with practices in the world of work. A needs assessment survey was conducted in the Pomona area when the district was planning the construction of a vocational skills center. Private sector businesses were asked to identify specific occupations and training to be offered, their own training and updating needs, their willingness to assist in program operation (work experience and co-op placement stations), and their potential for job placement for program graduates. Completed surveys were returned by approximately 200 local businesses.

Another example of private sector involvement was the solicitation of feedback from concerned local employers on the content of an advanced welding program to be instituted at the vocational skills center. Employers were sent a listing of proposed program content, by topical areas, and asked to verify the importance of this content in the curriculum. Additions to or revisions of the listing were also requested.

Finally, local business and industry personnel are invited to tour the vocational program facilities in operation. This is done in an effort to minimize the distance between vocational programs and the prospective employers of their program graduates. Responses from visiting business and industry personnel indicate that such tours allow private sector personnel to feel that they have input into the development of the program curriculum. Furthermore, they result in increased willingness on the part of local businesses and industries to hire program graduates.

Up-to-date technological plant. Every effort is made, within the means of the district, to maintain the latest tools, equipment, and machinery in the physical facilities of the vocational programs. As new equipment is installed, teachers are given training in its use.

Nonlocal Programs

Many programs of technological update activities are organized and presented by agencies other than individual schools, colleges, or districts. Such programs can be carried out under the auspices of state departments of education, universities or other teacher education institutions, or professional organizations.

Administrative Characteristics

- The intended audience for such programs is the constituency served by the sponsoring agency. In the case of a state department of education, it would most likely be tional teachers in the state. A teacher education institution would aim to serve teachers in the geographic area from which it normally draws enrollments. A professional organization would target its activities to its members.

- The sponsoring agency uses its own resources, at least in part, in funding the program of activities. State departments of education often have at their disposal state or federal funds, perhaps specifically earmarked for professional development purposes. Universities or teacher education institutions have their normal operating budgets and often charge regular tuition and course fees to participating instructors. Professional organizations have their treasuries to draw on and may charge activity fees as well.

- Often, such nonlocal agencies collaborate in sponsoring and presenting a program of technological update activities. A program of activities may be part of a formal, ongoing collaboration; such is the case in the state of Pennsylvania. There, the state department of education has sponsored a program of workshops that are offered at each of the state's four Vocational Education Professional Development Centers—four major universities, one located in each geographic quadrant of the state and responsible for serving teachers in that area.

- On the other hand, the specific collaboration can be an ad hoc arrangement solely for the purpose of implementing a program of update activities. As an example, the Michigan Department of Education funds a Vocational Education Personnel Development Project that is operated by Michigan State University. This project was initially a collaboration between the state department and the Michigan Association of Area School Administrators, a statewide professional organization. For two years, the collaboration was extended to include the Michigan Department of Labor on behalf of CETA personnel.

- A similar situation exists in Missouri, where the state department of education, the University of Missouri, and the Missouri Vocational Association jointly sponsor a statewide summer conference. Real incentive is provided for teacher attendance: state recertification policy requires that teachers attend at least three summer conferences per five-year recertification period.

- Examples of technological update programs sponsored by a single agency also abound. The state of Utah is beginning to implement a statewide program of placing secondary vocational teachers in summer employment. Likewise, the University of Southern Maine offers a Related Occupational Experience during the summer months as part of its course work. The state of Washington has for several years run a program of update workshops; Kentucky operates a staff exchange program; South Carolina has thematic resource centers; and Alabama has a statewide curriculum updating effort in place.

- The content of such programs is generally determined by a needs assessment carried out by the sponsoring agency, covering the entire constituency of that agency. As a result, the content of update activities is usually governed by the needs of the majority and may or may not meet the needs of any single given teacher. In other words, the population of automotive teachers of an entire state may have, as its greatest need, updating in electronic ignitions. Yet an update activity on electronic ignitions would not meet the needs of any teacher who possessed current knowledge and skills in that particular area but was out of date in catalytic converters.

- Once the needs assessment is completed, the program of update activities can take on many forms. Programs may consist of workshops, conferences, or seminars; work experience internships; staff exchange between vocational education and business or industry; summer employment; or participation in industry training and updating programs. In short, almost any delivery technique can be used in such a program of technological update activities.

- Such programs of update activities usually provide some incentive for teacher participation. State department-sponsored programs are usually operated at no cost to participants, with reimbursement provided for travel, food, and lodging as appropriate. Professional development or recertification credit is often extended for participation, as well. University-sponsored programs sometimes require that participants pay tuition and course fees; this is offset, however, by the regular course credits received by participants. Furthermore, these course credits often have further indirect benefit to participants because they can be used to fulfill professional development or recertification requirements.

- Since the events of this type of program of update activities are often repeated, some attempt is usually made to evaluate the effectiveness of each event. Participants are often given short, informal instruments on which to rate the appropriateness of content and effectiveness of delivery. This feedback can then be used in planning for the next event. In addition, some such programs are attempting to institute a regular updating of their needs assessment. The state of Michigan's Vocational Education Personnel Development Project, for example, has plans to resurvey teacher updating needs every two years.

Like local programs, nonlocal programs for technological update of vocational/technical teachers are significantly different from the specific techniques for the delivery of instruction. As pointed out earlier in this section, however, almost any kind of delivery technique can be used in a program of update activities sponsored by these other education agencies. The differentiating feature is the locus of administrative control.

The programs under discussion here are *not* planned and implemented by local educational authorities. In many instances, local teachers and administrators are involved in planning and implementation, but the primary impetus and support come from others with more wide-ranging responsibilities.

Programs of this nature also differ from casual teacher participation in update activities available, for example, through teacher education institutions or professional organizations. The difference is that the activities are organized and presented as a *whole program* and not selected and carried out individually on a piece-by-piece basis.

Advantages and Disadvantages

Audience served. One advantage of programs offered by nonlocal agencies is that they are more likely to involve a greater number of teachers than any given technique implemented by a single school, college, or district. The formal needs assessment process that is likely to accompany such a program helps to ensure the appropriateness of update events to the needs of the whole population of teachers. The evaluation component aids in either comfirming the appropriateness of content and effectiveness of instruction or providing the basis for modification.

Responsiveness. A disadvantage of such programs, however, is that any single update event may not be appropriate to the needs of a given teacher. Since content is determined by the results of needs assessment, the majority, naturally enough, tends to rule in this process. Unless the sponsoring agency has unlimited funds at its disposal—unlikely in this day and age—teachers who do not fit the majority pattern may not be able to benefit from a program catering to the wider constituency.

On the other hand, the size of the potential target audience increases the likelihood that a large enough number of teachers will express a particular content need that an event to address it will be justified. Although a single teacher with a more esoteric update need may have difficulty arranging an appropriate update activity, a statewide survey may identify enough teachers with the same need to justify the inclusion of an appropriate activity in an overall program.

Other advantages or disadvantages of a given program of update activities would arise from the particular form of the activities offered. Each of the delivery techniques that could be used has its own set of strengths and weaknesses. These would of course be present in a program sponsored by any of the nonlocal agencies concerned.

Barriers and Facilitators

In general terms, the same kinds of barriers and facilitators that apply to local programs also apply to programs of update activities carried out by nonlocal agencies. However, these barriers and facilitators operate not only among local administrators and vocational teachers but also among the personnel of the sponsoring agency.

Motivation. To follow this line of reasoning, the motivation and sense of responsibility felt by the personnel of the sponsoring agency become critical factors. If, for example, a state director of vocational education has a personal commitment to ensuring that the vocational teachers of the state stay abreast of the changing technologies of their fields, an update program sponsored by that state department is more likely to be successful. In fact, commitment on the part of key administrators makes it more likely not only that such a program will be carried out successfully, but that it will even be considered. Motivation, sense of responsibility, and commitment are perhaps more crucial in nonlocal programs because of the distance between the personnel involved and the ultimate consumer of the program, the individual vocational teachers. The greater the distance between the sponoring agency and vocational teachers, the easier it becomes for the personnel of the sponsoring agency to view the updating of teachers as someone else's responsibility. "Out of sight, out of mind" may be trite but true.

Money. Likewise, the availability of resources can be either a barrier or facilitator to the implementation of nonlocal programs of update activities. No agency—local, statewide, or national—can carry out any kind of program of activities without the money to fund it. Some of the agencies described in this section may have considerable financial resources at their disposal, but such resources invariably have many competing demands upon them.

Relationship between sponsor and audience. One possible barrier or facilitator unique to such programs of update activities is the relationship maintained between local vocational administrators and teachers, on the one hand, and the sponsoring agency on the other. If individual teachers see the pedagogical and technological components of teacher education programs as irrelevant to their own needs, they will be less motivated to participate in update programs sponsored by teacher education institutions. If a state department program of update activities is seen as imposed from above, teachers will again be less motivated to participate.

If, on the other hand, a good working relationship of mutual trust and respect is maintained between local vocational educators and the sponsoring agency, teachers will be more likely to participate. In this event, the authority and stature of the sponsoring agency can become a powerful facilitator in the implementation of a program of update activities. When teachers perceive that such an agency, with its wide focus of concerns and responsibilities, has singled out a need of theirs to address, a positive response to the agency's activities becomes much more likely.

Finally, there may be other barriers and facilitators particular to the specific delivery techniques used in a program of update activities. Participating in a university seminar may be distasteful to a given teacher who is disinclined toward the world of formal academics. For a teacher who is getting tired of going to one workshop after another, it will probably matter little who sponsors the next one in a seemingly interminable series. And activities requiring the involvement of local businesses and industries will still be helped or hindered by the quality of the relationship maintained with those concerns.

Specific Program Descriptions

Michigan Vocational Education Personnel Development Project (VEPDP). In 1977, the Michigan Association of Area School Administrators (MAASA) decided that there was a need for a statewide personnel development plan for vocational/technical teachers. By mid-1978, MAASA, Michigan State University (MSU), and the Michigan Department of Education's Vocational-Technical Education Service had set up a project to update the technical competencies of area vocational center instructors.

In its first year of operation, the project had approximately equal funding from MAASA and the Department of Education. During the second year, MAASA did not provide further funding, but the Michigan Department of Labor began to provide some funding on behalf of CETA personnel. Funding from the Department of Labor continued into the next year. Since then, the Department of Education continued to fund the project alone. Furthermore, the level of funding from the Department of Education has increased significantly since the first year of the project—from $10,000 in 1978-79 to $406,000 in 1981-82.

Since the project's inception, its focus has expanded significantly as well. VEPDP now includes activities targeted at vocational administrators as well as teachers; in addition, postsecondary as well as secondary personnel are served. VEPDP continues to be housed in the Department of Administration and Curriculum of the College of Education at MSU. As of this writing, VEPDP staff consists of a director, a coordinator, a full-time secretary, and seven part-time graduate assistants.

VEPDP staff are responsible for planning, implementing, and evaluating project activities. This process begins with the conduct of needs assessment surveys; it goes on through securing presenters, arranging facilities, ordering refreshments, and taking workshop reservations. Finally, staff attend the workshops and analyze participant evaluation responses.

For the first two years of operation, VEPDP activities concentrated exclusively on technology as opposed to pedagogy. Beginning with the third year of activities, pedagogy was also addressed, although technology remains the primary thrust of activities. Further, VEPDP activities remain focused solely on the professional development needs of inservice vocational educators. VEPDP operates statewide, includes all secondary and postsecondary teaching and administrative personnel in all occupational areas, and has an active advisory committee representing all the types of personnel involved. In order to meet the needs of the personnel it serves, VEPDP uses the following six-step process in planning an agenda of activities:

1. Conduct a professional development needs assessment.
2. Locate and catalog training sources.
3. Match professional training needs with appropriate training sources.
4. Develop appropriate delivery systems.
5. Organize seminars, workshops, short courses, and internships.
6. Evaluate results and make improvements.

To date, a total of six major needs assessment surveys have been completed. These include one each for industrial arts, secondary vocational teaching competencies, community college technical update needs, and administrator needs, and two additional assessments for secondary-level technical update needs. These needs assessments are scheduled to be updated on two-year cycles.

A training source directory has been developed, with hundreds of entries, including numerous business and industry sources. A variety of delivery systems have been developed to meet the identified professional development needs of personnel served. Inservice activities have been offered during regular working hours, ranging from one to five days in length. Activities are presented at various sites throughout the state (often at business and industry sites); opportunity to attend is equalized, as VEPDP reimburses participants for mileage and meal costs.

VEPDP workshops fall into two distinct types: the fall/spring series and the summer series. The fall/spring series is tailor-made in response to the professional needs assessments conducted of various personnel. These workshops are set up and managed by VEPDP personnel. The summer series, on the other hand, consists of "hitchhiking" workshops—independently conducted business and industry training events and programs that are willing to accept vocational education personnel for enrollment. Hitchhiking events are reserved for the summer, as they may last as long as two weeks. VEPDP personnel identify such events and promote them through a statewide mailing direct to individual teachers and administrators. Hitchhiking events concentrate solely on updating technological needs.

The tailor-made events of the fall/spring series address pedagogy as well as technology and administration. Typically, a specific need identified through the needs assessment is matched with an available training source (from the training source directory, it is hoped) in business, industry, or trade organizations. VEPDP staff then organize an appropriate inservice workshop or seminar for vocational personnel with that training source.

In the most recent year of VEPDP activities (1981-82), over 2,000 instructors have been served by the two series of events—more than 70 tailor-made and 80 hitchhiking events have been sponsored by the project. Since the program first began in the spring of 1979, approximately 4,000 teachers and administrators have attended 232 workshops offered throughout the state.

South Carolina Design for the Eighties. The South Carolina Technical Education System (TEC) was founded in 1961 to train people for specific jobs identified within the state. The system performed satisfactorily, training and placing students into jobs with local businesses and industries. However, in the late 1970s, business and industry began asking TEC to provide training for sophisticated technologies that had not yet been developed. TEC personnel decided, therefore, that a new effort was in order to meet this newly found need.

TEC personnel visited businesses and industries and consulted educational authorities and other knowledgeable experts in an effort to study the effects of changing technology. The State Board for Technical and Comprehensive Education sponsored a series of fourteen listening sessions at technical colleges throughout the state, so that business and industry leaders could relate their concerns about high technology training and productivity.

As a result of these inquiries, TEC's investigating committee recommended the establishment of six thematic resource centers at existing technical colleges. These centers would provide training and promote productivity by offering industrial seminars, conducting faculty training, and maintaining information banks on the specific technologies in their charge. The six resource centers established are as follows:

- Advanced Office Occupations Center, Midlands Technical College, Columbia
- Advanced Machine Tool Technology Resource Center, Greenville Technical College, Greenville
- Robotics Resource Center, Piedmont Technical College, Greenwood
- Water Quality Institute, Sumter Area Technical College, Sumter
- Microelectronics Resource Center, Tri-County Technical College, Pendleton
- Computer Applications Resource Center, York Technical College Rock Hill

Each resource center assumes statewide responsibility for specialization in its own technology. Center directors consult with leading industrialists in the field to devise faculty and staff training programs, collect resource materials, design or modify physical facilities to accommodate training needs, evaluate instructional equipment, and develop plans to keep up to date with new production methods. In the planning stage now at the TEC resource centers is the use of mobile training units to house portable labs with appropriate equipment that can be transported to different sites for training purposes. Demonstrations, workshops, and courses will be possible with the use of these mobile units.

The establishment of one of the six resource centers appears to be a truly significant collaborative relationship between vocational education and industry. The Robotics Resource Center at Piedmont Technical College received more than just moral support from Cincinnati Milacron, a robotics manfacturing concern. To date, Cincinnati Milacron has provided consulting and technical assistance to Piedmont staff and has placed robotics manufacturing equipment on loan in the resource center.

Cincinnati Milacron had interest in the Robotics Resource Center because it was building a manufacturing plant nearby. Piedmont Technical College had promised to provide preemployment training for prospective workers. While the plant was under construction, Cincinnati Milacron sent in machinery and experienced personnel to provide training to future instructors in the use of the equipment. By the time instruction was scheduled to begin at the resource center, two Piedmont instructors had attended a six-week work experience program at the Cincinnati Milacron home plant, a one-week training session at a General Electrics robotics facility in New York, and a Cincinnati Milacron robotics conference in Ohio. They had also visited the Wright-Patterson Air Force Base CAD-CAM Center in Ohio and various robotics manufacturers in Michigan.

The state provided funding for the equivalent of one year of released time so that the two instructors could engage in these activities The state also provided $67,000 to purchase robots for the center, to add to an $80,000 robot on loan from Cincinnati Milacron and a $40,000 robot on loan from Seiko. Last, a national advisory council of robotics manufacturers, researchers, developers, and users is being assembled to ensure that the Robotics Resource Center's efforts in the area stay up to date.

Of interest is a quote from an unidentified corporate head in a promotional brochure for Design for the Eighties:

> Technology is changing so fast that no education system can project our training demands. Sometimes we can't always do it. The best education can hope for is to fast-follow our technology to prepare students for change.

Accordingly, *fast-follow* has become TEC's watchword. Believing that Design for the Eighties is a flexible, responsive plan, TEC personnel feel that their greatest challenge is to keep it that way by working closely with industry in an approach that involves their entire technical college system in partnership with industry to meet the need for better training and greater productivity for the decade of the 1980s.

University of Southern Maine: Related Occupational Experience. Vocational teachers can enroll in the University of Southern Maine's Related Occupational Experience program for academic credit. In some cases, this credit can be applied toward an academic degree; this determination is made by the teacher's academic advisor. Teachers can also get Continuing Education Units for participation in the Related Occupational Experience program.

The core of the program is that teachers spend from two to ten weeks as regular employees of a business or industry in the occupation in which they teach. Teachers may or may not be paid for their time and work by the host business or industry; this matter is to be decided by the instructor and host firm together. University promotional materials say that pay is neither encouraged nor discouraged. Teachers participate in the program during the summer months.

In applying for participation in the program, teachers are required to identify the new skills they are going to develop to aid in their teaching. They must also submit a copy of their present course curriculum, a statement from their craft committee expressing support for the teacher's participation in the occupational experience program, and an outline of the training program to be undertaken worked out jointly by the teacher and the host firm. Most teachers locate host business or industry sites themselves, although assistance in this task is available from program personnel at the university.

The university coordinates and supervises teacher participation in the related occupational experience. Part of this teacher participation consists of two seminars held at the university—one in the summer, during or before actual on-site work experience activities, and one in the fall, after the experience is completed. Teachers are required to complete a written report on the occupational experience describing technological advances observed, new content to be incorporated into classroom or laboratory instruction and the means of doing so, and such specific job data as the host firm is willing to share. Finally, teachers must develop a written follow-up project providing for changes or adaptation in their vocational program based on the summer's related occupational experience.

Kentucky Vocational Staff/Industry Exchange Program. In operation since 1974, the Kentucky staff exchange program was originally funded through a grant from the Appalachian Regional Commission. The premise behind the first year's operation of the project was that vocational teachers and administrators would exchange work stations with appropriate skilled technicians and supervisors from businesses and industries where students of vocational programs were employed. It was found during the first year of implementation, however, that it was not feasible for business and industry personnel to leave their regular work positions for various reasons. On the other hand, various ways were identified in which business and industry could assist vocational educators in providing relevant occupational education. Furthermore, business and industry were able to profit by the contact with vocational educators to identify teaching and learning strategies to put into practice in their own training programs. The program has retained its original name, even though the exchange component has been lost.

By the end of 1981, the staff exchange program had served over 1,000 vocational teachers and administrators and involved over 900 businesses and industries. The initial implementation of the program was judged to be so successful that it is now operated and funded by the state of Kentucky for all vocational teachers and administrators in the state. The program has precisely stated goals for teachers, administrators, and representatives of business and industry. The goals of teachers and administrators concentrate on the identification and—for teachers—development of new skills and techniques that reflect current business and industry practices. Those for business and industry personnel are to identify ways to assist in the provision of relevant occupational education and teaching/learning strategies to put into practice in their own training.

As the program currently operates, specific roles and responsibilities are assigned to six different types of personnel, as follows:

- **The vocational educator**—Both teachers and administrators who participate in the staff exchange program follow a step-by-step procedure outlined in program materials. Educators first complete a self-assessment from which they then develop a one- to five-year plan for professional development. In this process, they identify specific objectives for instructional improvement through work experience. They work with their immediate supervisor in applying for the staff exchange program. Once accepted, they report to work in business or industry as scheduled, completing required reporting forms: a daily activity report and an evaluation of the appropriateness of the overall exchange experience. Upon completion of the work experience, educators must incorporate their recent work experience into instructional programs, document the results and achievements of the staff exchange experience, and update their self-assessment plans.

- **The immediate vocational supervisor**—The supervisor of the vocational teacher or administrator who participates in the staff exchange program also has several tasks to perform within the program. The supervisor first helps the educator to develop his or her own self-assessment and identify work experience objectives. The supervisor also assists in developing an extended employment plan, planning a work schedule, and identifying a work site for the staff exchange. The supervisor then is responsible for securing approval of the educator's application to the staff exchange program. Once approval is secured, the supervisor orients the business or industry sponsor to the educator's objectives and the sponsor's role in the staff exchange, and visits and evaluates the educator during the work experience. Upon completion of the experience, the supervisor guides and directs the educator in accommodating the recent experience into instructional programs, submits the results of the staff exchange objectives as implemented, and assists the educator in updating the self-assessment plans.

- **The regional staff exchange contact person**—Although the regional contact person is not responsible for working with individual educators or visiting work sites, he/she does help to coordinate the mechanics of the experience. The contact person coordinates and disseminates staff exchange information and materials to vocational supervisors and acts as a resource person to supervisors in placing staff exchange applicants. He/she coordinates the approval, collection, and distribution of paperwork and various staff exchange activities with regional and local personnel and vocational teacher educators. The contact person furnishes information to the staff exchange program director as necessary for project reports and management.

- **The teacher educator**—The teacher educator is responsible for assisting in the pedagogical aspects of the staff exchange program: working with educators and supervisors in developing self-assessment plans, identifying work experience objectives, informing educators of college credit requirements when such credit is sought, and visiting and evaluating those educators who seek college credit for the staff exchange work experience. The teacher educator may also assist supervisors with work experience visits and evaluations on request. Finally, he/she helps educators incorporate work experience objectives into instructional programs and update their self-assessment and professional development plans.

- **The staff exchange program director**—The program director is the head administrator responsible for the overall planning, implementation, and evaluation of the staff exchange program. The director keeps educators and business and industry personnel informed about the program and directs the activities of teacher educators and regional contact personnel. He/she develops, coordinates, and monitors the program budget; furnishes print and audiovisual materials and forms for program activities; and plans advisory committee meetings and annual conferences. Finally, the program director is responsible for coordinating and conducting inservice training for immediate supervisors and evaluating staff exchange activities each year.

- **Business and industry sponsors**—The sponsoring business and industry sites at which educators are placed for their exchange experience also have stated responsibilities. They must agree to provide work experience activities for educators that will allow educators to meet their individual objectives. They are to evaluate the educator's performance and verify his/her time and activities. Finally, they should permit supervisors or teacher educators to visit and evaluate the educator on the job and provide appropriate input into vocational education activities.

The staff exchange program does provide reimbursement for various expenses associated with educator participation. The program will pay for the cost of substitute teachers, so that participating teachers can be given released time for the activity. Furthermore, educators are reimbursed for travel, lodging, meals, and miscellaneous (e.g., tolls, parking) expenses.

Industry Training and Updating Programs

In some instances, vocational/technical teachers are able to obtain needed update of their technological knowledge and skills through training events presented by business and industry. Although not always available to all teachers in all occupational specialities, this form of update is often considered to be of great value.

Administrative Characteristics

The following are typical characteristics of business and industry training and updating programs:

- Industry training and updating programs most often take the form of workshops, conferences, and seminars. Such events are offered by a business or industry in order to train its own personnel in new technology related to products or services.
- Secondary and postsecondary vocational/technical instructors are often invited to participate in industry training events. Instructor participation helps to ensure that program graduates will have the specific technological knowledge and skills needed by potential employees of the business or industry.
- Many industry training events are offered to vocational instructors at no charge.
- The content of industry training and updating programs is based on the perceptions of the sponsoring industry's own needs. Hence, content is specific to the products, services, and concerns of the sponsor. As such, content often includes both knowledge of technology and skills required by the technology.
- Industry typically uses its own in-house training personnel as instructors in training and updating programs, and programs are generally presented at industry sites.
- Vocational teachers may be provided with released time for participation in industry training and updating programs. They may, in addition, be reimbursed for travel expenses and fees for participating in the program. Reimbursement and provisions of released time depend for the most part on availability of funds.

The feature that differentiates industry training and updating programs from other programs of workshops, conferences, and seminars is sponsorship and its resultant effect on content. Industry-based programs are organized and presented by industry in response to its own felt needs, which include vocational education only indirectly. Vocational instructors often participate in industry-based programs because the needs of industry and those of vocational education largely coincide in accommodating the effects of technological change. The same explanation applies to the more specifically targeted content of industry training and updating programs.

Advantages and Disadvantages

Nature of Instruction. A major advantage of industry training and updating programs as a means of technological update is that they tap what is probably the best possible source of expertise. The industry personnel that provide instruction in such programs are in a position to be fully aware of the specific technology in question and the skills required in its particular application. In addition, the industry sites at which training is usually offered have the advantage of having available the particular equipment and physical facilities related to training content.

The specificity of content in most industry training and updating programs has a further advantage in providing update. This specificity of content makes it more likely that instructors will choose to participate in a given training event in response to specific update objectives of their own. The more specific the content of the program, the greater is the guarantee that it will be chosen as an update activity because it is relevant to instructor's needs for knowledge and skills.

One more advantage of the nature of instruction provided in industry training and updating programs is the inclusion of both knowledge and skill acquisition in instruction. The specificity of content, the high level of teaching expertise, and the availability of physical equipment in business or industry combine to allow both information and practice to be included in instruction.

Content coverage. One disadvantage of the nature of instruction provided in industry training and updating events is quantity. The short-term nature of the events dictates that only a limited amount of content can be covered if it is to be covered in any depth. Hence, a given training event may be quite appropriate for the content it covers but insufficient for teachers' overall need for updating.

Barriers and Facilitators

Money. Availability of resources plays the role of both barrier and facilitator in industry training and updating programs. In the first place, many such industry events are offered to vocational teachers at no cost. The sponsoring business or industry often feels that there is sufficient indirect, long-term benefit to itself to justify this. Thus, the high-quality instruction of industry training events is often available at no direct cost to vocational educators.

Often, however, vocational teachers and administrators must bear the indirect costs of participating in industry training events. Since such events are generally offered at industry sites, teachers must often pay for travel and lodging to attend the event. Furthermore, most such events take place during normal business hours—when most vocational teachers are scheduled to be teaching. Instructor participation frequently depends upon the provision of released time from teaching duties. The provision of this released time and reimbursement for travel and lodging expenses can strain the budgets of many vocational administrators. If no funds are available for these purposes, many vocational teachers will be less likely to participate in the training.

Policy. The relative value assigned to this type of activity in policy statements can also impede or facilitate its use. In most cases, policy statements do not differentiate between industry training and updating programs, on the one hand, and workshops, conferences, or seminars in general. Industry programs are usually treated simply as workshops, for example, and assigned a fairly realistic relative value for professional development or recertification purposes.

Access. Finally, the limited availability of industry training and updating programs can act as a barrier to the use of this approach for technological update. Not all vocational teachers have easy access to such events. Out-of-state travel is sometimes required, involving the additional barrier of many states being unwilling to fund out-of-state travel under current economic conditions. Travel reimbursement is not, of course, the only factor involved; many teachers are seriously enough committed to their profession to pay their own way. However, the selection of sites for these events responds to the needs of the sponsoring business or industry. The greater the distance to the training site, the less likely it is that vocational teachers will be willing and able to participate in the event.

Specific Program Descriptions

State of Missouri. Various efforts are made in the state of Missouri to promote vocational teacher participation in industry training events. Sometimes, industry training events are brought onto university campuses in the state; in other cases, instructors attend industry training events offered at industry locations.

An example of an industry training event brought onto a university campus is the Digital Electronics Technology Seminar hosted by the Industrial Education Department of Northwest Missouri State University at Maryville. The two-week seminar was sponsored by Lab-Volt Systems, a private electronics firm. The seminar was promoted through a memo sent by the Director of Industrial Education of the State Department of Elementary and Secondary Education to vocational administrators of electronics programs. Administrators were asked to inform all their electronics instructors of the seminar. Enrollment in the seminar was limited to twenty persons.

Tuition was charged for the seminar. Participants not requiring lodging could pay $64.00 for course materials only; participants requiring lodging and meals could pay $177.90 for course materials, lodging, and meals. Out-of-state participants were charged appropriately higher tuition fees. It was specifically stated that all fees were for the purpose of defraying the expenses of the university.

Activities of the seminar included twenty hours of lecture time and forty hours of hands-on lab time. The university offered two credit hours (graduate or undergraduate) for participation in the seminar. The credit hours qualified for fulfilling requirements for the renewal of the five-year state vocational certification. In addition, the university announced the offering of a complementary problems course for the following quarter in which participants could also enroll.

Examples of industry training events offered on-site at industry locations are three summer automotive workshops—two General Motors events and a Chrysler event. News of these events was disseminated, again, by the Director of Industrial Education at the State Department of Elementary and Secondary Education in a memo to vocational administrators. Administrators were asked to pass on word of the workshops to instructors.

The GM workshops were each held in GM training centers. A four-and-one-half-day workshop was held at their training center at Shawnee, Kansas, on numerous recent changes in GM vehicles: electronic fuel injection systems, computer command control systems, diesel engines, automatic transmissions, and so on. Three four-day workshops were held at the St. Louis, Missouri, training center on computer command control systems and electronic fuel injection, new GM transmissions, and diesel engines. Participation in all of these workshops was free.

The Chrysler workshop, a four-day event, was held at the Chrysler training center in St. Louis, Missouri. This workshop addressed numerous technological advances in Chrysler products: front-wheel drive vehicles, computer-controlled carburetion and fuel injection, oxygen feedback systems, automatic and manual transaxles, drivelines, and rack-and-pinion steering gears. Once again, no fee was charged for instructor participation.

MISCELLANEOUS APPROACHES

There are, in addition to the techniques and programs presented previously for providing technological update, some other means of accomplishing the same task. This final set of techniques tends to be less often used and has, in plain terms, lower potential for allowing teachers to acquire the up-to-date knowledge and skills they need in today's technological work place.

Affiliation with Professional and Trade Organizations

Most vocational schools and colleges urge or even require their teaching staff to become members of appropriate professional and trade organizations. These professional and trade affiliations are seen as a positive benefit to the individual teacher, the institution, and the students served. Such affiliations offer teachers the opportunity to develop personal contacts within the teaching profession and their own technical trade, to participate in various activities related to teaching or the trade, and to use information resources that might otherwise not be available to the individual. It goes without saying, of course, that active rather than passive membership is the preferred mode.

The advantage of professional and trade affiliations to teachers in need of technological update is that these organizations can serve teachers primarily as resources. Many of these organizations do offer some program of activities; some of these activities might well provide teachers with specific technological knowledge and skills, but they are not generally comprehensive enough to form a substantial part of update efforts. More useful is the meeting ground such organizations offer to participating teachers in which personal contacts can be made and information and other resources identified and shared.

Many vocational education institutions do offer teachers full or partial reimbursement for the expense of professional affiliation. This reimbursement makes it more likely that teachers will maintain their professional and trade affiliations, although the cost of such affiliation is not generally so great as to act as a barrier if it is not reimbursed.

Policy can either help or hinder teacher affiliation with professional or trade organizations. If administrators show a strong commitment to teacher affiliation in policy statements and set an example by their own professional affiliations, teachers will again be more likely to maintain memberships. Obviously, teacher motivation can also affect the extent to which affilation occurs, although it could justifiably be said that the activity involved in affiliating is so slight that the motivation required is minimal.

Reading Professional and Technical Publications

Reading about the application and advancement of technology is another way for teachers to update themselves in their teaching fields. In fact, reading is a necessary part of many of the approaches to technological update. Books, professional and trade journals, technical materials—these and other print resources abound in all technical areas. These resources may be highly technical in nature and intended only for a limited audience of practicing professionals. Or, they may be aimed at the general public; the shelves of almost any bookstore contain books and magazines dealing with current technology and its effects on our personal and work lives.

One disadvantage of reading as an activity to gain technological update is that it limits the reader to acquiring *knowledge* of technology and its uses. Teachers obviously do not have the chance to learn new technological *skills* when they are curled up in an armchair with the latest copy of *Scientific American*. An offsetting advantage, however, is that teachers can read about any technical area in as much depth as allowed by the resources they can locate.

Barriers and facilitators do operate in the implementation of this technique for updating. In the first place, some teachers are favorably inclined toward reading and others not. In the second, print materials must be available before they can be read. If teachers are located in large metropolitan areas or near major universities—with the library facilities that each of those implies—access to print materials should be no problem. Not all vocational teachers are so ideally located, of course.

On the other hand, one advantage of professional affiliations is that they often include free subscriptions to journals or occasional papers published by the organization. In addition, many vocational education institutions subscribe to appropriate professional and trade publications and place them in their in-house libraries.

Advisory Committee Contacts

Yet another means used by schools and colleges to provide technological update to their teachers is maintaining contact with advisory committees. Many institutions use the members of their advisory committees as information resources. As such, members can often identify areas of technological change and specific changes in technology of which teachers should be aware. In addition, they may know of training or updating events occurring in local business or industries, or of business or industry sites to which teachers could return for updating in one kind of experience or another. Or, they may be able to identify a practitioner in the technology with up-to-date expertise who could provide instruction in an update event (someone to give a workshop, for example).

The disadvantage of contact with advisory committee members as a means of technological update is that members can generally provide only information. The information provided may be extremely useful (e.g., an industry site at which a teacher can get part-time employment for a summer) but can generally serve as only the first step in a longer process of obtaining needed update. The advantage of such contact, on the other hand, is that most advisory committee members should be in a position to know the specifics of the local situation and of the technology in question.

One possible barrier or facilitator to the use of advisory committee contacts is the quality of the relationship maintained with members of the committee. If teachers or administrators actually work with members, allowing them to fulfill the advisory function to its fullest, members will be much more favorably disposed toward the school or college and its staff. If the committee, on the other hand, is restricted in practice to one pro forma, rubber-stamp meeting per year, there will not likely be any real contact to maintain with members.

In-House Cross-Training

Some schools and colleges make allowance for teachers in one program area to offer update activities to teachers in other program areas. A workshop or seminar is probably the most common activity to be offered by one member of the teaching staff to others. As an example, an instructor in data processing could present a workshop to teaching staff in marketing and distributive education on the set-up and use of computerized inventory control systems for retail businesses.

One advantage of such cross-training events is that all concerned personnel are located together at one place and can communicate their needs, purposes, and intents clearly and easily to one another. This should help to ensure that the content of such training is appropriate to the needs of participating teachers.

On the other hand, cross-training of this kind is often limited to information activities, with little possibility of hands-on practice for teachers. The weight of this disadvantage is minimized, however, by the fact that such cross-training is often appropriate, in the first place, only for teachers who need knowledge of new technology and its applications in their own fields. Furthermore, hands-on practice is not impossible, only less likely in this setting.

An obvious barrier to the use of this approach to technological update is teacher motivation, especially on the part of staff members who would present the event. Teacher motivation sometimes receives a boost from policy statements: some institutions give professional development credits to teachers who *give* training to other teachers; other policy statements do at least establish the possibility of paying teachers for their time and effort in giving training to others.

Student On-the-Job Training

One postsecondary institution reports that its teachers are able to obtain technological update as they coordinate student on-the-job training experiences. This coordination allows teachers the opportunity to observe the technology of the work place, gaining insight and instruction for themselves in the process.

Outside Consulting Work

Another postsecondary institution encourages teaching staff to accept outside consulting work as a means of obtaining technological update. It would appear logical that such consulting work would give teachers the opportunity to gain knowledge and even skills relating to new technology and its applications. However, if teachers do not have the up-to-date knowledge and skills necessary to perform the specific work involved in a consulting job, it is difficult to understand how they are going to get those consulting jobs to begin with.

BARRIERS AND FACILITATORS: GENERAL CONSIDERATIONS

As can be seen from the discussion of individual approaches, three factors tend to operate across the board as either barriers or facilitators in providing technological update. Those factors are resources, motivation, and policy. A fourth factor, access, operates only to a limited extent.

Resources

In fact, resources can mean only one thing: money. Money is needed to pay for activities that are sponsored by a vocational education institution or agency, to reimburse teachers for direct and indirect expenses involved in out-of-school activities, and to pay for substitute teachers so that full-time faculty can be provided with released time. When money is available to pay for update activities, the likelihood that teachers will engage in these activities is considerably increased. Scarce resources are a barrier to technological update; plentiful resources, a facilitator.

Motivation

Like resources, motivation is either a barrier or facilitator to technological update. When motivation is high, teachers and instructors are more likely to seek and gain updating; when it is low, they are less likely to do so. Motivation has more dimensions than resources as a barrier or facilitator, however.

Motivation is important not only among teachers and instructors but also among administrators, the business and industry community, and sometimes among organized labor. Institutional and district administrators must be motivated to budget resources for technological update activities, to provide administrative support for such activities during their own work day, and to provide leadership and direction to teachers as they seek updating. Businesses and industries must be appropriately motivated toward vocational education if teachers seek updating through any of those approaches that involve, in one way or another, a return to the world of work. Likewise, the motivation of organized labor sometimes becomes crucial—as, for example, when teachers seek part-time employment in competition with members of organized labor organizations.

Motivation is also important in the higher echelons of vocational education planners and policymakers. Teacher educators, professional development leaders, and state and federal department of education personnel increase the likelihood that teachers will stay up to date when they accept and fulfill their own responsibility for providing leadership, direction, programs, and ultimately, resources. It would not be an exaggeration to say that the motivation of all the actors and agents involved in the provision of technological update is a crucial factor—a facilitator when favorable, a barrier when not.

Policy

Policy toward teachers' responsibility to keep up to date becomes as critical a factor as resources and motivation. The effect of policy on the use of individual approaches has been discussed: how the relative weight in PDCs, for example, can lead teachers to choose one activity over another. This logic can be applied to another facet of certification—recertification—and to professional development policies in general.

State certification policies, for example, tend to place emphasis on two areas of teacher preparation: pedagogy and technology. Such policies often spell out very carefully the knowledge, skills, or experience required of applicants in these two areas. However, all too often this careful balance between pedagogy and technology may be lost in recertification and professional development policies. These policies often appear to focus much more closely on the refinement of teachers' pedagogical skills than on the maintenance of up-to-date technological skills. Whenever this situation exists, teachers will be more likely to focus their own efforts toward recertification or professional development on the pedagogical at the expense of the technological.

This is not to say that the pedagogical component of such policies should be eliminated—far from it. The proper conclusion is simply that the relative weight assigned to pedagogy and technology in such policies will naturally lead teachers and instructors to concentrate their own efforts in the area with the greater payoff. Thus, the relative weight of pedagogy and technology becomes another barrier or facilitator in obtaining technological update.

Access

Access to the opportunity to gain technological update appears for the most part to be considerably less critical than the other three factors discussed. Although teachers and instructors certainly cannot gain updating if they do not have the opportunity to do so, access to facilities and sources of expertise seems to be of relatively little concern. Apparently, the real problem in providing technological update does not, in general, lie in finding sources of it.

Implications

The overall status of efforts to provide technological update to vocational/technical teachers and instructors is somewhat anomalous. Many vocational educators report considerable success in using one or more of the approaches discussed here to update teachers. The fact remains, however, that vocational teachers, as a whole, are not staying up to date with the fast-changing technologies of their fields. How can this be, if known and effective approaches to technological update exist?

The answer to this question may lie in the barriers and facilitators to the provision of technological update. It may well be that the key to keeping teachers up to date in their technologies lies in capitalizing on what is known—using known approaches in a manner that minimizes known barriers and maximizes known facilitators. The specific roles and responsibilities of all the actors and agents involved in the process could be defined; known methods for improving and maintaining motivation among those actors and agents could be recommended and used; policy could be clarified; and the potential of individual approaches could be realized by setting up clear guidelines and procedures for selection and use.

Vocational educators—teachers, instructors, administrators, planners, and policymakers—could all benefit from further work toward this end. The need to update teachers' technological knowledge and skills is certainly unlikely to disappear in this world of microchips and microwaves. It is tempting to conclude that at least some of the tools to do the job are already at hand and that all that is lacking is the knowledge to use them efficiently and effectively.

APPENDIX A: PROCEDURES

Information on approaches currently being used to provide technological update to secondary and postsecondary vocational/technical teachers was gathered from three principal sources: perceptions of qualified observers of the status of technological update at either the secondary or postsecondary level in eighteen states; on-shelf materials furnished by secondary or postsecondary educational institutions and agencies describing their own approaches to providing technological update; and review of the literature in the area.

Observer Perceptions

Study of recent work of the National Center and review of the literature suggested that there were individuals at both the secondary and postsecondary levels throughout the country who had recently addressed the need for or approaches to technological update in their respective states. It appeared that such persons might knowledgeably speak to the approaches utilized within their respective states, thus eliminating the need for more time-consuming methods of data collection in obtaining primary-source data from individual institutions.

It was therefore determined that knowledgeable individuals would be identified in nine states to prepare papers for the National Center addressing the nature and extent of the need for technological update of secondary vocational teachers in their respective states. The consultants were also asked to describe approaches used for technological update of teachers in their states, the apparent effectiveness of the approaches, and barriers to those approaches. Similarly, consultants were identified in an additional nine states to prepare papers addressing the nature and extent of the problem of technological update of postsecondary vocational/technical teachers and approaches utilized in their respective states.

Selection of States and Consultants

Criteria were established for the selection of states to be represented in the status study and for the selection of consultants to prepare papers addressing the need and the approaches utilized. Criteria for selection of states included the following:

1. Different regions of the United States would be represented in each of the two sets of nine states chosen.
2. States chosen would, as a group, represent all of the following: predominately industrial states, predominately agricultural states, and those in between. These classifications were determined by examining the ratios of values of farm commodities to values of manufacturing.
3. States with statewide systems of area vocational schools and states without them would be included in the secondary set.

4. States with statewide systems of postsecondary institutions and those without them would be included in the postsecondary set.

5. States requiring certification of postsecondary vocational/technical teachers and states not requiring such certification would be included in the postsecondary set.

The major criterion in the selection of individual consultants was that the person filled a position in which he or she was aware of the various aspects of the problem and approaches to meeting needs for technological update of vocational teachers or postsecondary instructors in his or her state.

First, a listing of potential consultants was compiled through literature searches to identify individuals knowledgeable regarding teacher technological update at the secondary and/or postsecondary level. State directors of vocational education were contacted, either directly at a meeting of new state directors held at the National Center or by letter, asking them to nominate the two most knowledgeable individuals in their respective states regarding technological update of secondary vocational teachers. They were also asked to suggest the most knowledgeable individuals regarding technological update of postsecondary instructors. Similarly, state coordinators of postsecondary vocational/technical education were asked by letter to nominate one or more potential consultants.

Two sets of potential consultants and states were then developed using the classification of states and the listings of potential consultants: one set of nine consultants to address the secondary level and one set of nine consultants to address the postsecondary level. In the selection of candidate consultants, priority was given to those consultants receiving multiple recommendations and/or having evidence (e.g., through the literature) of expertise regarding the problem. For each state and consultant selected, an alternate state and consultant were identified for substitution in the event that the first consultant was unable to undertake or complete the task. With this approach to the selection of states and consultants, it was possible to include in the study most states that were recognized through the literature as giving attention to the need for technological update of teachers and/or utilizing specific approaches in addressing such needs.

Figure 1 shows the geographical distributions of the states included at the secondary and postsecondary levels. Listings of the consultants who prepared papers and their respective states are shown in Appendix B. Of the initial eighteen consultants and states chosen, thirteen developed papers. In four cases it was necessary to go to the backup consultant and state in order to secure a commitment to development of the paper within the allotted time frame. In one case, although the selected consultant was unable to develop the paper because of other demanding responsibilities, a qualified replacement was available within the state.

Development of Consultant Papers

In order to ensure a degree of comprehensiveness of treatment of the problem area by each consultant and to achieve a degree of uniformity of organization within the papers, a topical outline was developed by National Center staff for use by secondary consultants. A similar outline was developed for use by consultants addressing the problem at the postsecondary level. National Center project staff were available to respond to questions and for consultation by telephone during the develpment of the papers.

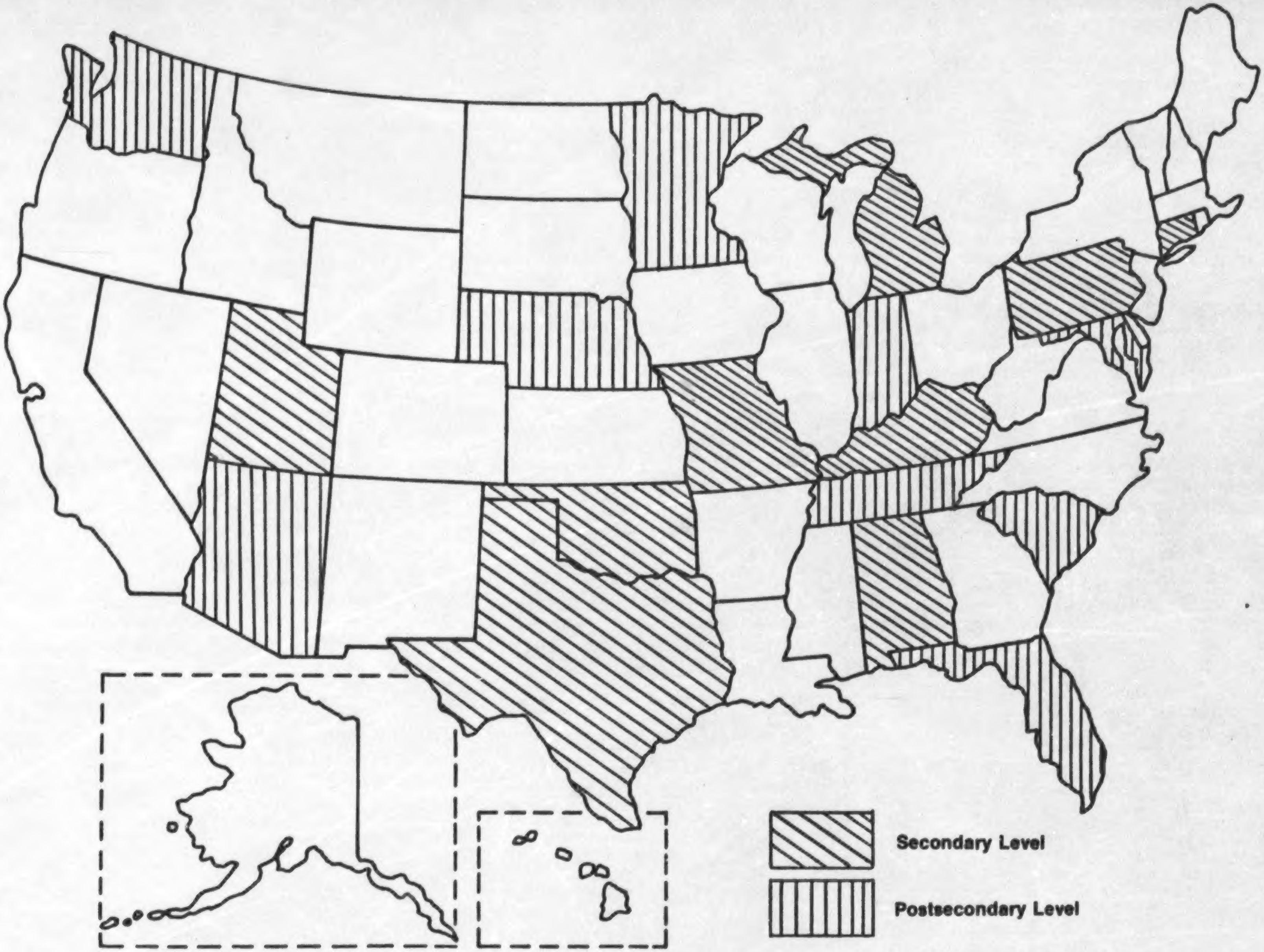
Secondary Level
Postsecondary Level

Figure 1. States for which consultant papers were developed on technological update of vocational/technical teachers.

Although consultants were selected because of their knowledge, interest, and expertise regarding vocational teacher technological update in their respective states, most sought additional input from vocational service area supervisors, professional development coordinators, directors, and other knowlegeable individuals as they developed their papers. In some cases, the paper was a result of a collaborative effort of several individuals and the consultant. Knowledge of such collaboration serves to increase the confidence one can place in the perceptions reported by individual consultants.

On-Shelf Materials

The National Center's Human Resources File was consulted in order to identify secondary and postsecondary schools, institutions, and districts from which to solicit information. The following four categories of the file were used:

- Community and junior colleges: cheif administrators, presidents, and deans
- Vocational-technical institutes (postsecondary): chief system administrators or presidents
- Area and joint secondary vocational-technical systems: cheif system administrators
- K-12 education systems: chief vocational-technical, career, and adult education administrators

Approximately 550 secondary and postsecondary schools, institutions, and districts were identified and asked to furnish on-shelf descriptive materials relating their own approaches to the provision of technological update to teachers and instructors. The request specified on-shelf print materials of any kind describing technological update approaches: brochures, flyers, pamphlets, staff development handbooks, policy or position statements, or program or procedure descriptions. Documents were requested that were intended for use by teachers, administrators, business or industry personnel, or any others involved in efforts to keep vocational teachers abreast of the technology of their fields.

Literature Review

A review of the literature was conducted to identify books, journal articles, papers, presentations, and other materials related to the provision of technological update to vocational/technical teachers. Twenty-five descriptors pertaining to the area of technological update were used in searching the following literature bases:

- Educational Resources Information Center (ERIC)
- ABI-INFORM
- Research and Development Exchange (RDx)
- Dissertation Abstracts
- The Ohio State University Libraries
- Conference programs for the American Vocational Association, the American Educational Research Association, the American Psychological Association, and the Midwestern Psychological Association

Abstracts were obtained of materials cited, and full copies of specific materials that seemed to have promise were obtained and reviewed.

Summary of Information

The information contained in the collected materials describing approaches used to provide technological update to teachers was summarized in order to establish a generic description of each approach. Administrative and instructional characteristics of each described approach were considered to be indentifying factors in assigning an approach to a particular generic approach. This was necessitated by the wide variation encountered in the names used by different schools, institutions, and agencies for their efforts in technological update.

Selection of Promising Approaches

The generic approaches that were identified were analyzed using several criteria in order to identify promising approaches: the effectiveness of the approach, the efficiency of the approach, the appropriateness of the approach to different teacher needs, the nature of instruction available using the approach, and the locus of administrative control. Application of these criteria led to the selection of the nine promising approaches presented in this document.

Analysis of Promising Approaches

An analysis of the information contained in collected materials and generic approach descriptions led to the identification of advantages and disadvantages of each approach and barriers and facilitators that affect the use of each approach. Advantages and disadvantages center on the nature of instruction available through the approach and the source of expertise and quality of physical facilities put at teachers' disposal. Barriers and facilitators are those factors that tend either to encourage or to discourage teacher motivation to participate in the particular activity.

Specific Program Descriptions

Individual programs were selected from among those described in materials collected to exemplify each generic approach. Descriptions of these individual programs were developed using information from the materials collected and such further information as was necessary to describe the program in question fully. Additional information on individual programs was obtained through telephone contact as appropriate.

APPENDIX B:
CONSULTANTS AND THEIR RESPECTIVE STATES

The following are consultants who authored papers on the status of technological update and promising approaches to it at the secondary level in their states:

- OKLAHOMA: Vic Van Hook, Associate State Director for Occupational Programs, Oklahoma Department of Education, Stillwater
- ALABAMA: James Kendrick, Director of Vocational Curriculum Development, Alabama Department of Education, Montgomery
- KENTUCKY: Charles W. Wade, Director, Division of Program Development, Kentucky Department of Education, Frankfort
- MICHIGAN: George Ferns, Professor of Secondary Education, Michigan State University, East Lansing
- MISSOURI: Franklin King, Professor of Industrial Education, University of Missouri, Columbia
- PENNSYLVANIA: Joyce R. Moyer, Research Associate, Pennsylvania Research Coordinating Unit, Harrisburg
- CONNECTICUT: Gloria Williams, Consultant for Professional Development, Connecticut Department of Education, Hartford
- UTAH: Gary Lloyd, State Specialist for Business Education, Utah Office of Education, Salt Lake City
- TEXAS: R.D. Bristow, Director, Texas Research Coordinating Unit, Texas Education Agency, Austin

The following are consultants who authored papers on the status of technological update and promising approaches to it at the postsecondary level in their states:

- NEBRASKA: Robert E. Klabenes, Campus Director, Southeast Technical Community College, Milford
- TENNESSEE: Thomas Delbridge, Director of Administrative Services, Tennessee Department of Education, Nashville
- SOUTH CAROLINA: G. William Dudley, Executive Director, State Board for Technical and Comprehensive Education, Columbia

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- FLORIDA: W.R. Jeffries, Director of Programs and Staff Development Section, Florida Department of Education, Tallahassee
- INDIANA: Isaac K. Beckes, President Emeritus, Vincennes University, Vincennes
- ARIZONA: Eugene L. Dorr, Associate Director for Educational Services, State Board of Directors for Community Colleges, Phoenix
- WASHINGTON: James L. Blue, Consultant, Olympia
- MARYLAND: Joseph DeSantis, Specialist in Postsecondary and Adult Education, Maryland Department of Education, Baltimore
- MINNESOTA: Gerald Briggs, Teacher Education and Upgrading Specialist, Minnesota Department of Education, St. Paul

It should be noted that in several instances more than one individual contributed to the writing of a paper. Consultant writers received the willing cooperation and assistance of co-workers, associates, and others in their efforts to gather perceptions concerning the status of technological update in their states; writers then coordinated this input in developing the paper itself.